USAID FIRMS PROJECT

# Dairy Sector 3 Year Strategy Phase I

March 31, 2010

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# Data Page

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# Abstract

This report is the result of the development of an exploratory consultancy under which numerous meetings and much research was developed with business leaders, producers, farmers, processors, industry associations and government officials in the Pakistani dairy sector. This process was necessary to understand the current competitive position of the sector in order to design and present a strategic action plan for the development of the sector over the next three years.

This consultancy seeks to attain specific objectives through the implementation of the strategic plan presented below, such as helping the dairy sector players reposition themselves in world markets by reaching higher levels of quality, production and competitiveness.

After a period of nearly four weeks of research meetings, interviews and evaluation of findings that took place mainly in the provinces of Sindh and Punjab (where 90% of the milk in the country is processed and produced), the consultancy hereby presents the following document to be considered for implementation as a self-sustainable strategic support initiative for the Pakistan Dairy Industry.

# Acronyms

| | |
|---|---|
| ASA | American Soybean Association |
| BRI | Buffalo Research Institute |
| CDM | Clean Development Mechanism |
| CEBG | Center of Excellence for Bovine Genetics |
| CEO | Chief Executive Officer |
| CIA | Central Intelligence Agency of the United States of America |
| CSR | Corporate Social Responsibility |
| DFA | Dairy Farmers of America |
| DP | Dairy Pakistan |
| DTDC | Dairy Training Development Centre |
| EF | Engro Foods Limited |
| FAP | Farmers Association of Pakistan |
| GM | General Manager |
| GM P | Good Manufacturing Practices |
| GOP | Government of Pakistan |
| GPS | Global Positioning System |
| HACCP | Hazard Analysis of Critical Control Points |
| HDNP | Handbook of Dairy Nutrition of Pakistan |
| HR | Human Resources |
| KDFA | Karachi Dairy Farmers Association |
| LDDB | Livestock and Dairy Development Board |
| LLW | Lady Livestock Workers |
| MCC | Milk Collection centers |
| MFAL | Ministry of Food, Agriculture & Livestock |
| MIP | Ministry of Industry & Production |
| MPG | MPG Milk Processing Group for LDDB |
| MT | Metric Ton. |
| NRB | Nili-Ravi Buffalo |
| NWFP | North West Frontier Province of Pakistan bordering Afghanistan |
| PDA | Pakistan Dairy Association |
| PDDC | Pakistan Dairy Development Company |
| PR | Pakistan Rupees |
| SLDD | Punjab's Secretary of Livestock and Dairy Development |
| SME | Small & Medium Enterprises |
| SMEDA | Small & Medium Enterprise Development Authority |
| UN | United Nations |
| UNDP | United Nations Development Program |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USAID | United States Agency for International Development |
| USB | United Soybean Board |
| USDA | United States Department of Agriculture |
| USFDA | United States Food and Drug Administration |
| UVAS | University of Veterinary and Animal Sciences |

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# Executive Summary

Between February 15 and March 5, the consultant performed exploratory activities as a basis for the design of a coherent three-year strategy and work plan, that will help the Pakistan Dairy sector become more efficient and standardized if successfully implemented. The strategy to be implemented is expected to help the sector reposition itself for long-term competitiveness with quantifiable benefits for the entire dairy value chain and for the Pakistan economy overall. The evaluation and analysis has included most components of the value chain with the intention to build sector-wide consensus and assess any possible fallouts. The areas of the value chain include: farming and production, breeds, nutrition, human resources, standards and certifications, packaging, transportation, cold and dry storage, gender inclusion, pricing structure, policy reforms and possibly international marketing of Pakistani dairy products.

The evaluation process was concentrated in the provinces of Punjab and Sindh, as these two regions represent close to 7/8$^{th}$ of the milk production and animal husbandry in the country. Using a global knowledge and understanding of the milk value chain in addition to the more than seventy-five meetings and interviews with sector professionals, producers, service providers, industrialists and government officials, the report presented herein portrays general conclusions and a list of specifically recommended activities to be implemented for the most effective three-year strategy.

**Figure 1: Typical Pakistani buffalo farm**

During the implementation of the proposed strategy, the Firms Project must work directly with sector leaders among producers, farmers, processors, industry associations and government officials so a current competitive position is clearly understood for the entire sector. The strategic action plans presented are practical steps that the private sector and public sector members of the dairy value chain can take to boost competitiveness in the industry. While strategy development has been based on

rigorous evaluations and analysis, the focus of this effort will be on implementation. A critical review of any current strategic work for the sector and identification of any existing gaps must be taken into account. This way we will avoid any duplication of efforts and the maximization of a multiplier effect on those activities already being implemented and/or strengthened by the Firms program. A key in reaching any objectives will be attained by engaging the local and regional industry players and governmental leadership in ways that can maximize the initiatives and create a sense of ownership by the sectors' leaders.

The strategy recommended in this report is based in the implementation of the following recommended activities and in order of priority as presented below:

1. Clearly, any strategic development of the activities presented herein will require the proper **development and design of an interactive website** that will not only allow beneficiaries and program supporters interact with the program, but also be constantly updated so the program activities and any research or activity results are published promptly. It is important to clarify that the activities recommended in this report are based on models that will require initial technical support and reduced financial back-up in its implementation period. However, they are designed such that once running, each model or activity must be self-sustainable and generate a level of profitability that will attract incoming members into the dairy value chain. This will help strengthen the entire sector and increase production and competitiveness by allowing models to be replicated and multiplied.

2. **Installation of chilling tanks**, which will allow the creation of new Milk Collection Centers in rural areas of Punjab & Sind. This activity is recommended to be developed jointly with the larger milk processors and possibly other sector development institutions.

3. **Feeding and Nutrition Efficiency Research** must be developed further to be able to determine the optimal volumes of feed and water animals must take in order to produce the maximum amount of milk. Normally feed consumption is between 20 and 30 kg for production levels between 5 and 10 liters of milk. Finding the minimum amount of food intake required for the average yield will present substantial savings in feeding thus more income for the farmers.

4. **Promote animal water consumption**. It is very common in Pakistan that in rural areas and other more developed farm areas, the animals are tied most of the day, thus limiting their water consumption. Water consumption is essential in milk production, thus it must be promoted and more extensively supported.

5. Most animals in rural Pakistan are tied full-time, and water and feed is given to them by their caretakers. This practice limits the consumption of water which, as explained in the previous point, is not beneficial for milk production. Thus, there is a need to implement an initiative that promotes and helps **develop and install**

**animal pens** so the livestock can be set loose and given sufficient water. These pens could also be sponsored by national consumer product companies as a means of advertising in exchange for their support and contribution.

6. The creation of new commercial farming will create a demand for **commercial farm managers**. These type of professionals are not commonly found in Pakistan. A practical training program developed jointly with the private sector in current commercial farms will help satisfy this demand with quickly trained individuals that will earn better income or become new commercial farmers themselves.

7. **The development and promotion of commercial farm models**. Pakistan is characterized by rural milk production for close to ninety percent of the national figures. Commercial farms are not common with a handful of exceptions. It is imperative that the sector is populated with more commercial and mechanical farming using high-yield cattle breeds. This program is recommended to be implemented jointly or in addition to similar programs that local sector organizations are already applying.

8. Due to reasons that may require further research, Pakistan is not characterized as a cheese-making nor a cheese-consuming nation. However, it is recommended to implement a **program in which women and household members are trained in cheese-making** in order to utilize the evening milk in some rural and colony areas. The type of cheese recommended is the tropical kind, such as those made in Mexico or other African nations, a product that will require minimal or no refrigeration. Once cheese-making is a widely practiced activity, benefits for women in supporting female livelihoods will be evident.

9. **Development and training of Lady Livestock Workers**. This recommended activity is simply the replication and continuation of the UNDP-CELDAC model, a program which was successfully developed, but its implementation period has concluded. This activity clearly expands sector-strengthening while gender inclusion is more balanced.

10. **Anaerobic Digesters of animal waste should be installed** in rural farms, Colonies and Larger commercial Farms. This waste management practice will not only prevent environmental destruction, but will also generate energy and produce more efficient fertilizer ingredients.

11. Currently the area has already formed **Farmer Clusters Milk Production Groups**. These groups are currently selling their milk collectively to industrial processors, but do not have the freedom to negotiate to their benefit since buyer options are minimum. Helping more groups of farmers associate to collectively sell their milk, and furthermore to collectively process their milk, will allow these clusters to develop more successfully.

12. **Research for Breed Improvement** must be supported in Pakistan. Even though this is a long-term activity, it is necessary to work jointly on all the presented activities due to the limited time span of the FIRMS program. It is necessary to support and help develop the breed development establishments that were visited during this evaluation period, as well as additional establishments that may exist in Pakistan.

13. Although attracting investment in Pakistan at this time is a challenging proposition, the possibility of exploring for export markets in a category of dairy products processed from Buffalo milk could be explored. **Buffalo Mozzarella cheese** is a product with extensive demand in the upper-end tourist destination of the Indian Ocean and other large Asian and Northern African urban areas. This is a clear business proposition that could attract local consortiums to venture into the business, thus presenting an attractive formula for foreign processors or international distributors.

14. In order to help update some of the dairy organizations visited, the **need for websites** was observed. It is necessary in today's environment to have websites so members and users are informed, and are able to participate in general to help develop the organization further. The Firms project should assist KDFA and other dairy associations in their development of modern websites. This activity can be developed by female website designers so gender inclusion can be even more expanded.

Furthermore, the effectiveness and success of the three year strategy presented will depend heavily on the ability of the Sector Lead assigned to its implementation, including his ability to interact with every member of the sector individually and as a team. The dynamics of the implementation must present every activity to be developed in a way so that the benefits created by each activity are general to all members, equal in importance, and complimentary to each other; thus attaining guaranteed success and self-sustainability in the long term.

# 1.0 INTRODUCTION

Pakistan is the 36th largest nation in the world with a total area of 796,095 square km, of which 96.83% is land. Its climate is mostly hot with dry desert temperate in the northwest and arctic weather in the northern mountains. Its altitude range spans from the lowest point in the Indian Ocean to a highest point of 8611 m at Mt. Godwin-Austen. The total area of irrigated land is 182,300 square km (based on 2003 data). Its land use is distributed between arable land (24.44%), land with permanent crops (0.84%), and other land (74.72%).

Annually, this nation removes approximately 169.39 cubic km of water from its limited natural fresh water resources, which is equivalent to a per capita consumption of 1072 cubic meters per year. However, most of the population does not have access to potable water. There is widespread water pollution from raw sewage, industrial wastes, and agricultural runoff. Deforestation, soil erosion and desertification are also common.

## DEMOGRAPHICS (Sept 2009)

(Source: CIA World Factbook) https://www.cia.aov/librarv/publications/the-world-factbook/aeos/pk.html

**Population:**
174,578,558 (July 2009 est.)

**Age Structure:**
0-14 years: 37.2% (male 33,739,547/female 31,868,065)
15-64 years: 58.6% (male 52,849,607/female 50,378,198)
65 years and over: 4.2% (male 3,475,927/female 3,931,605) (2009 est.)

**Median Age:**
Total: 20.8 yrs. Males: 20.6 yrs Females: 21 yrs

**Population Growth Rate:** 1.555% (2009 est.)

## NATIONAL DAIRY FIGURES

Pakistan is a nation that traditionally has a high level of dairy consumption, with a per capita consumption of milk and milk products of nearly one liter a day (0.98l/day-see data below). This makes Pakistan one of the largest milk consuming nations worldwide, with an increase in demand for milk equivalent to the national population growth.

Additionally, according the Pakistan Association of Powder Milk Importers, dry milk imports during 2006 were 27.1 thousand MT. Taking into consideration that whole milk solids are 13 to 18 percent of the fluid (depending on the species of origin cow - buffalo respectively), and assuming that the powder milk imported was fat free, which represents 10 % of milk solids, this amount of milk is generated by a total of 271 billion (thousand millions) liters of fluid skim milk. This figure represents and augmentation of 742.46 thousand liters to the national daily consumption of milk in Pakistan. In total, this would be equivalent to a daily production of fluid milk of 142.5 million liters per day. The additional milk imports would be equivalent, based on the official yield figures, to and additional need of milk producing animals of 88 thousand buffaloes or 121 thousand cows. This is sufficient evidence of feasibility, based on volume of milk and revenues, to justify any new industrial milk drying facility to be established in Pakistan.

**Table 1: Total number of milking animals**

| | Species | Units (million) | Data 1996 | Data 2006 | % Variation |
|---|---|---|---|---|---|
| | Cows | Head | 60.61 | 61.46 | +1.4 |
| | Buffaloes | Head | 77.09 | 79.27 | + 2.8 |
| | Goats | Head | No record | 141.7 | - |

**Table 2: Average daily milk production yield per animal**

| Species | Units | Data 1996 | Data 2006 | % Variation |
|---|---|---|---|---|
| Cows | Liter | 6.3 | 8.7 | + 38.0 |
| Buffaloes | Liter | 7.8 | 10.2 | + 30.8 |
| Goats | Liter | No record | 4.7 | |

**Table 3: Daily Production**

| Species | Units (million) | Data 1996 | Data 2006 | % Variation |
|---|---|---|---|---|
| Cows | Liters | 37.4 | 53.3 | + 42.5 |
| Buffaloes | Liters | 62.0 | 82.1 | + 32.4 |
| Goats | Liters | No record | 6.4 | - |
| Total | Liters | 99.4 | 141.8 | + 42.7 |

Source: Pakistan Livestock Census 2006, GOP Statistics Division, Agricultural Census Organization

Although there is official census of the data presented, an analysis of the statistical model utilized to arrive to these results could be questioned. The methodology used was based on sampling selections by region, and its results extrapolated geographically. This questioning is common ground where most professionals and business individuals concur as discovered during the development of this consultancy. It was not uncommon to hear remarks that questioned the validity of the census, claiming that the real figures could be much lower. In order to identify the geographical distribution of yields, animal population and total milk production, the following table is presented to further understand the censed reality and to be utilized during the application of any recommended strategy or activity for the sector.

**Table 4: Geographical distribution of yields, milking animal population and total milk production by province**

| GEOGRAPHICAL DISTRIBUTION OF YIELDS, MILKING ANIMAL POPULATION AND TOTAL MILK PRODUCTION BY PROVINCE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Avg Animal Yield | | Total animals in Milking | | | | Total Liters Produced | | | |
| Province | Cow | Buff | Cow | % | Buffalo | % | Cow | % | Buffalo | % |
| NWFP | 5.08 | 7.281 | 1,874,617 | 21.59 | 808,068 | 7.91 | 9,538,051 | 17.96 | 5,883,543 | 7.17 |
| Balochistan | 6.153 | 7.606 | 616,734 | 7.10 | 127,171 | 1.24 | 3,794,763 | 7.15 | 967,262 | 1.18 |
| Punjab | 6.316 | 7.708 | 4,050,048 | 46.64 | 6,233,315 | 60.99 | 25,580,103 | 48.18 | 48,046,392 | 58.55 |
| Sind | 6.617 | 8.903 | 2,143,036 | 24.68 | 3,051,119 | 29.86 | 14,180,469 | 26.71 | 27,164,112 | 33.10 |
| Pakistan | 6.042 | 7.875 | 8,684,435 | 100.00 | 10,219,673 | 100 | 53,093,386 | 100 | 82,061,309 | 100 |
| | | | | | | | | | | |
| **Punjab + Sind** | **6.47** | **8.31** | 6,193,084 | **71.31** | 9,284,434 | **90.85** | 39,760,572 | **74.89** | 75,210,504 | **91.65** |

Source: Pakistan Livestock Census 2006, GOP Statistics Division, Agricultural Census Organization

In conclusion, this table tells us that the best yield averages and vast majority of milking animals and milk production in the provinces of Punjab and Sind, yield averages per animal of 6.47 and 8.31 liters per cow and buffalo respectively, accounting for close to three quarters of the total cow population and production of cow milk and over ninety percent of the total buffalo population and buffalo milk production. Based on the objectives of the donor of this program, the geographical areas of concentration could be determined.

The largest percentage (80% - 90%) of milk in this country is traded through informal commercial chains. Producers sell their milk to milk carriers and these carriers sell it to milk product stores in practically every town and city where the milk is sold to the public unpasteurized and other products such as cream and yogurt are made and sold to the general public. A very small percentage of the milk will go through carriers of collection centers to formal processing and distribution channels.

The vast majority of milk in Pakistan is sold unpasteurized; however, it is common practice by the people in general to boil milk before consuming it. The quality of the milk from a physiological and chemical perspective (sick animals & medicated animals), is definitely unknown since the product never goes through a formal analysis, with the exception of milk going to processing plants. However, even in the case of processing plants, the milk received is from such a large number of farmers that deliver as little as 2 liters of milk to the plant's collection points, that if any milk comes from a medically treated or untreated sick animal, it will be mixed with the rest of the milk received. Any high levels of unacceptable components in the milk will dissipate and pass undetected through the quality control laboratories. Based on the hygiene practices of animal husbandry in the cattle colonies around Karachi and in the villages around towns and other cities, it is common at the national level to find severe cases of mastitis (see #11. in the reading references) in animals that produce milk that is not apt for human consumption under international standards.

**The most common dairy products consumed in Pakistan are:**

- Fluid Milk
- Powder Milk
- Plain Yogurt
- Yogurt Plain
- Yogurt with flavors or other ingredients
- Ghee (a blend of yogurt with milk and water)
- Lessee (cream cheese)
- Butter
- Clarified butter as cooking oil
- Paneer (fresh cottage cheese like)
- Cream mostly in ice cream processing
- Khoya (a sweetened condensed milk pastry similar to "milk sweets")
- Cheese is almost totally absent from the value chain in Pakistan, with the exception of some processed cheeses that are manufactured industrially for use in the food service chain for pizza, sandwiches and other prepared ready to eat foods.

# 2.0 MEETINGS AND FINDINGS

The following is a briefing of each meeting and interview developed during the exploration period of the consultancy, in which the impressions, issues and ideas are gathered as expressed by the parties met. These are not necessarily actual data or opinions of the Pakistan dairy sector but only that of the person or parties met with.

**Figure 2: Nili-Ravi buffalo**

The traditional and local breed of dairy cattle in Pakistan is the Nili-Ravi buffalo. These are typically found mainly in Lahore, Sheikhupura, Faisalabad, Sahiwal, Multan and Bahawal Nagar districts in Punjab Province. Their color is black and their average weight at maturity is 800 kg for the male and 525 kg for the female. Traditionally they have light eyes and a white short mane on their forehead.

They have a wedge shape, massive frame, small curly horns, and wall eyes. They often have white markings on the forehead, face, muzzle and legs and white tip of tail (buffaloes with such markings highly desired and popularly called "Panj Kalian"). They have a large, strong udder and are generally docile. Average age at maturity is 30 months in males and 36 months in females. Longevity of production is good. A typical characteristic of this animal are the light eye irises longer horns and white hair in the tale tip and feet.

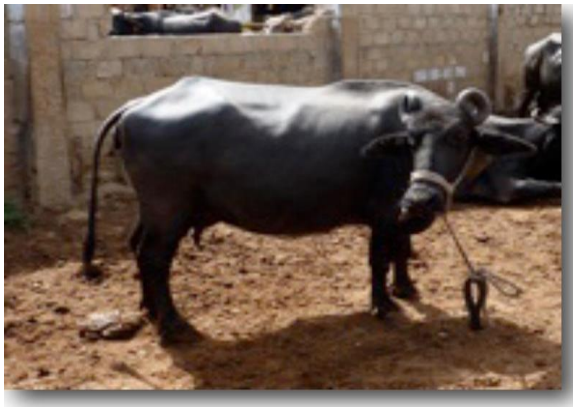


**Figure 3: Kundi Buffalo**

The other breed that is typical among the national buffalo cattle is the Kundi Buffalo, this breed of dairy cattle is usually found in the southern regions of the country, mostly the Sind province particularly in the districts of Dadu, Hyderabad, Karachi, Larkana, Nawabshah, Sanghar and Thatta . There are notable differences between these breeds, one is the difference in appearance from the Nili-Ravi breed, in that this is a completely black or graphite gray color animal. Their typical weight is 600kg for males and 375 kg for females, their horns are smaller and curly, and they have larger udders

**Monday February 15th Lahore**

**INTERNATIONAL TRADERS**

[redacted] is a supplier to the cattle and dairy industry in Northern Pakistan. He represents a semen supplier from Canada and milking parlor equipment from Germany, Westfalia. He also represents other suppliers to the sector, such as cattle brokers and chilling tanks. He is very active in the sector and has very good knowledge of all the players and their activities. [redacted] offered his assistance and cooperation in setting meetings with some of the key farmers and advisors of the sector and accompanied us during the visits on the 16th of February.

In [redacted] opinion, Pakistan's main obstacle to increasing milk production is the breed of cattle used for milking. Buffaloes do not provide high yields and the local cow breeds are not species that can provide the necessary yield to make a dairy farm operation profitable. The future of milk farming will switch from buffalo to cows and gradually to pure bred imported from Australia, Europe and the US.

[redacted]. Independent Dairy Consultant [redacted]

He is an independent Irish consultant who has been working as the industry advisor, to processors and larger dairy farmers, in northern Pakistan during the past 4 years. He seems to be very well connected and has offered to help our program link in with some leading dairy farmers in the area of Lahore.

**Figure 4: Common Regional Breeds**

In his opinion, the areas in which the dairy sector needs support and assistance in is developing more good crops for silage, along with good harvesting, storage and processing practices. He believes that controlling the cleanliness and amount of the water feed to the cattle will drastically increase the production of milk. Furthermore, he is convinced that fundamental nutrition standards, with particular attention to protein requirements both for growth and production, should be applied in addition to more assistance in applying good and effective fertility practices.

**Tuesday February 16th**
**Lahore SAPPHIRE FARMS**

In the past few years, as result of economic changes in Pakistan, some of the local larger commercial conglomerates have begun to diversify in the industry sector. Such is the case of Sapphire group, which has been a traditional textile manufacturer, but has ventured into a 3000 Holstein cow farm in peri-urban Lahore. In a farm land property of approximately have built a new state of the art dairy farm holding currently 800. All animals have been imported and more are on the way. Shortly they will start reproducing locally with imported semen to increase their cow population and reach their objective within the next three years. This farm model includes not only milk production, but also harvesting of crops for their own feeding consumption, a manure bio-digester to generate power for their own farm needs and the employment of foreign nationals to run the operation of all imported Holstein in operation 6 months.

**Figure 5: Sapphire 1000 Cow Dairy Farm**

This farm has the potential to become a training farm to train farmers in a 6 month certificate program independently form UVAS. A short certificate program in a farm of this type will be highly effective and could satisfy the demand for farm man agers for those new commercial farmers that are in the process of establishing operations. This training of farm managers could perfectly supply national demand; however, through international farm management placing services (see appendices), an international placement program could be established and orders of certified managers could be taken in advance thus allowing a local search of candidates to train, graduate and serve foreign operations.

**SMEDA (Small and medium Enterprises Development Authority)**,

www.smeda.org.pk Adnan Ali, Manager for Dairy and Livestock

This is the national institution that supports and promotes SME development in Pakistan. Mr. Ali described the current program that supports the development of commercial farms. Originally this program partially promoted and supported the establishment of 100 head dairy farms, however, being that the size was too large for the traditional farmer, the size of the farm model was reduced to 25 heads. Currently, there is a total of 19 successful farms already assisted, established and in operation, 16 of these being in the peri-urban area of Lahore. These small commercial farms all have milk chilling tanks and sell their milk to the industrial milk processors of Lahore. SMEDA not only supports these new farmers in the implementation and capacity building but also in providing services to the new farmers in nutrition, feed, good husbandry practices and animal health through SMEDA's own personnel. Through the intervention of Mr. Ali, all the farmers sell the milk at one equally negotiated selling price to the processor; they do not negotiate nor sell their milk independently. In exchange for these services, the farmers pay 1% of their sales to SMEDA to help sustain their services and operations.

Currently, SMEDA has within their short term plans the establishment of a total of one hundred farms in the next two years. The farms store their milk in-house and the processing plant picks it up at each farm; however, their future plans are to have a one main collection center for regional farmers in order to collectively deliver milk to processors in larger tanker trucks. Furthermore, in these collection centers they are planning to incorporate a milk processing plant that allows them to process their milk and distribute it commercially in their geographic areas. According to Mr. Ali, currently in Pakistan, only 10% of the milk produced is processed industrially by medium to large size farms. Approximately 30% of the milk consumed in Pakistan is imported in the form of powder, thus, he is convinced that the room for growth in this country is very ample. In his opinion, importation of pure breed cattle is necessary to promote milk production yields and to substitute the buffalo population which has extremely low yields (avg. 6 liter. Per day) compared to pure breed cows.

## Wednesday February 17th Lahore

### UNIVERSITY OF VETERINARY AND ANIMAL SCIENCES UVAS

http://www.uvas.edu.pk/Prof. Dr. Muhammad Nawaz, Vice Chancellor

This is a national upper education institution established in 1882, originally as a veterinary school. Traditionally it has attracted numerous international students from Africa and Asia, however presently it is not the case anymore. In a country where nearly l/8th of the GDP comes from Agriculture it is clear in [redacted]mind that income from the dairy sector is more than half of the total figure.

[redacted] believes that the current bottleneck in the dairy value chain is the lack of highly productive breeds of milk producing animals, poor nutritional practices and lack of attention to animal health. Currently milk is processed industrially up to ten percent of the total production volume, and its distribution is dominated by informal milk brokers "Dodis" who buy the milk from the rural produces and collect it in their own tanks and sell it in informal commercial establishment in small town and the peripheral urban areas of the main metropolitan center like Lahore and Karachi. The vast majority of milk producers are in the rural area, scattered through the entire country and this milk is mostly for family consumption. Thus it does not make it to any level in the value chain, although its consumed in rural areas, most milk consumed by villagers or through dodis is commonly boiled before consumption. The most common dairy products consumed in Pakistan are fluid milk, plain yogurt, yogurt with flavors or other ingredients, Ghee (a blend of yogurt with milk and water), butter, clarified butter cooking oil, Paneer (cottage cheese, and cream mostly in ice cream processing, Khoya (a sweetened condensed milk pastry similar to “milk sweets”). Cheese is almost totally absent from the value chain, with the exception of some processed cheeses that are manufactured industrially for use in the food service chain for pizza, sandwiches and other prepared ready to eat foods.

UVAS has its main campus in downtown Lahore, however, the visit took place in their new campus in the outskirts of Lahore. It is in an over one thousand acre land area on both sides of the road to Multan, where eventually the entire campus will be located. Here they have facilities for training in actual fisheries, sheep/cow/buffalo/goat farm husbandry training, research, laboratories, classroom facilities for general trainings, dormitories, animal pens, extensive crop harvesting, etc. Eventually the school is expecting to finish its own dairy training farm and processing plant with state of the art equipment in which farm managers will be trained through 2 year programs for Livestock Assistant and 3 year programs for certified Dairy Supervisors and also a 5 year BS degree in Farm Management. Their programs are supported by international equipment and service providers to the dairy farm industry such as Westfalia and Tetra Pak.


**Figure 6: UVAS new Campus in Patoki**

Currently they have nearly 200 students in these programs and he states that there is a waiting list of nearly three thousand students applying to register. Although their current students are mostly local, he is planning to promote the programs in other countries such as Yemen, India and Afghanistan. Currently, they have developed the Dairy Training Development Centre (DTDC) jointly with Holland Livestock Training Center, which can be evaluated further in order to identify possible joint training activities with Firms.

A new program being considered is to develop dairy farm technicians from different villages, where, through short term training programs, these village dairy technicians can go back to their villages and assist their countrymen in improving their livestock practices and dairy production. Furthermore, he is convinced that the buffalo population will steadily decrease at the commercial level since buffalo yields are so low and costly for this purpose. Also, it is in the interest of the university to develop and establish a vaccine production center specialized for the regional buffalo breeds which will gradually contribute to the health betterment of the breed.

## BUFFALO RESEARCH INSTITUTE (BRI):

[redacted], Chief Research Officer

A national institution in charge of research for the betterment of the local buffalo breeds, Neli-Ravi Buffalo & Kundi Buffalo, is one of the few, if any, buffalo research centers in the world. This institution has a large potential to develop semen production and breed research since: they count with well-established and well-equipped laboratories, have their own farm with manual milking process, and have a semen production center that is still under development. BRI serves the national Buffalo Breeders Association which counts with over 600 members and are documented in a very well developed directory. However, they apparently lack a proper operational business model in order to make the institution a self-sustainable operation, primarily due to the lack of a business plan that will allow them to get additional funding and a business-like operative administrative structure.Other Research institutes in the region for Buffalo Research: * Andhara Pradesh, India: Buffalo Breeding Centre, NDDB, Nekarikallu Haryana, India: Central Institute for Research on Buffaloes Guangzhi, China: Buffalo Research Center

## THE ASIAN BUFFALO ASSOCIATION (ABA)

This was founded on 23 November 1992 as a result of the unanimous recommendation reached at the Asian Buffalo Network Meeting that took place in Bangkok, Thailand, during the Sixth Animal Science Congress of the Asian-Australasian Association of Animal Production Societies. The Asian buffalo research and development institutions agreed to establish ABA. The overall objective of the association is to foster research and development on buffaloes in the Asian region. A series of conferences were held in the different Asian countries to share experiences, present new ideas and achievement in buffalo research and development. This organization develops every 3 to 4 years the Asian Buffalo Congress in different locations of the Asian Continent. Last October they developed their most recent congress in Lahore Pakistan, with a 3 day program and select guest speakers from 5 continents. www.abc2009.org/program/

## SWEETWATER DAIRIES:

[redacted]

A 300 cow farm with low yield production, mixed Holstein with local breeds, it counts with complete US installation system with a 30K chilling tank. Formerly a US owned operation now is 100% Pakistan and is run by [redacted], as farm manager who was trained on site. Although only 3 months into operation, the farm is well established and producing an average of 20 ltr. per animal daily. Eventually they will incorporate a bio digester of solids for generation of gas. Currently the dairy is under technical assistance by [redacted]

## Thursday February 18th Lahore

### LIVESTOCK AND DAIRY DEVELOPMENT BOARD (LDDB) www.lddb.org.pk

[redacted], Deputy Project Coordinator

The LDDB is an institution established under the provincial government of Punjab, operating independently from the Federal government's Ministry of Food Agriculture and Livestock. It is a part of Agribusiness Development and Diversification Project established by the GOP and run by a Board of Directors initially approved by Prime Minister, consisting of 15 Members Board of Directors - 6 from public sector and 9 from private sector representing all sub-sectors and provinces, and interaction with 43 Members of General Body representing all sub-sectors, provinces and regions.

This organization's objectives are:

- Promote, facilitate and coordinate the accelerated development of, and investment in, the livestock, poultry and dairy sectors
- Promote and facilitate marketing of livestock & livestock products
- Promote and facilitate producer-owned & controlled organizations
- Undertake capacity building of all stakeholders
- Facilitate, promote and support the development and dissemination of improved technologies

Current dairy related projects are:

- Meat Development Project (PSDP funded)
- Dairy Development Project (PSDP funded)
- Improving Reproductive Efficiency of Cattle and Buffaloes in Smallholders Production System (PSDP funded)
- Improving Dairy Production in Pakistan through Improved Extension Services (ACIAR funded)
- Progressive Control of Foot and Mouth Disease in Pakistan - Feasibility Study (ASPL funded)
- Poverty Alleviation through Small Holder Livestock & Dairy Development

Current Dairy Development program nationwide:

- Milk Collection and Collective Marketing from Small and Landless Farmers (300 Milk cooling units in 500 villages) through Milk Producer groups (MPG's)
- Support to Market-oriented Rural Dairy Farmers / Production of Quality Breeding Animals
- Production of Progeny-tested Bulls (Expansion of progeny testing program of Sahiwal cattle & Nili-Ravi buffaloes and initiation of program for Red Sindhi cattle and Kundhi buffaloes )

This institution has, during the past three years, implemented a program of aiding small and medium farmers with complete assistance in areas of nutrition, animal health, insemination, good farming and harvesting practices. Currently, a total of 200 associations of small farmers (MPG's), each of 30 to 40 producers, have been

established through assistance by their own staff of 200 extension service technicians (most technicians are graduated from UVAS). These farmers receive assistance in all the farming aspects such as vaccination, insemination, good harvesting and milking practices, farm husbandry, etc.

Out of total number or MPG's, 150 have chilling tanks in operation and the rest are in the process of having them installed. The LDDB also operates as a buying body for feed and other farm supplies, which sells with a minimum margin to the farmers. Some of the MPG's are already negotiating the sale of their milk as one entity, which is the case for the region of Kasur. Processors pay farmers twice weekly for their milk supply. There are cases where some of the MPG's have their own retail establishments where they have the option to sell their products and not deliver their entire production to the industrial processor.

Although this institution operates independently of the federal government and independent of any other organization with similar objectives such as Dairy Pakistan and SMEDA, it appears to be effectively and successfully implementing its program and the results can be easily appreciated in the tables below. [redacted] is confident that this number of MPG's will be raised to triple is number within the next two years. Below, we can observe the current results of the MPG's located in the peripheral urban areas of Lahore.

**Table 5: Current results of the MPG's located in the peripheral urban areas of Lahore**

| DISTRICT | MPGS (FUNCTI-ONAL) | CHILLIN G TANKS INSTALL -ED | TOTAL MEMB ERS | TOTAL ANIMAL S | TOTAL MILK PRODUCT I-ON IN LTR. | TOTAL CHILLED MILK IN LTR. |
|---|---|---|---|---|---|---|
| KASUR | 23 | 23 | 793 | 8895 | 24973 | 13998 |
| NOWSHEHRA N VIRKAN | 20 | 20 | 487 | 4496 | 15882 | 8134 |
| MANDI BAHAUDDIN | 17 | 17 | 365 | 4768 | 12075 | 4061 |
| TOTAL: | **60** | **60** | **1645** | **18159** | **52930** | **26193** |

**Table 6: Current results of the MPG are located in the peripheral urban areas of Lahore**

| DISTRICT | Total Feed pro-vided | Total Seed pro-vided | Total Farmers Trained |
|---|---|---|---|
| KASUR | 13,73,694 PRs | 902501 PRs | 2094 |
| NOWSHEHRAN VIRKAN | 3,88,500 | 8,72,815 | 1104 |

| | | | |
|---|---|---|---|
| MANDI BAHAUDDIN | 2,32,500 | 5,99,811 | 748 |
| TOTAL: | 19,94,694 | 23,75,127 | 3946 |

Table 7: Current results of the MPG are located in the peripheral urban areas of Lahore

| AVERAGE MILK COLLECTION | MILK COLLECTION | PRICE BENEFIT IN PR's |
|---|---|---|
| **Chiller/day** | **437 Ltr** | **1,966.5** |
| **Per 60 Chillers/Day** | **26,220 Ltr** | **1,17,990** |
| **Per 60 Chillers/ Month** | **7,86,600 Ltr** | **35,39,700** |

**Friday February 19th Lahore**

**PAKISTAN DAIRY DEVELOPMENT COMPANY (PDDC), Dairy Pakistan (DP)**
www.pddc.com.pk [redacted], CEO; [redacted], GM Extension; [redacted], Program Manager; [redacted], GM Community Farms

Dairy Pakistan, as it is known by, was established under a USAID initiative in 2006 as a non-profit industry association under the structure of the Ministry of Industries and Production (MIP). Its initial objective was and continues to be to unite the industrial processors (and service providers) and through a joint effort supply chilling tanks to medium farmers in order to secure the quality of raw milk being supplied into the formal milk processing. Currently, it operates under a totally publicly funded budget of approximately 8 million US$ and incorporates 8 ex-patriots in its management team. Its board of twelve directors includes four members of the private sector, two members from the farm/production area, and other members from academia, SMEDA, LDDB and the MIP.

So far, a total of 1200 milk cooling tanks and power generators have been installed throughout the country. They have programs to aid farmers to increase production yields and improve its profitability as a business unit. This program also includes assistance in acquisition and installation of mechanical milking parlors in some of the larger farms. With a staff of 100 technical experts they provide extension services to the farmers and confirm that the price of milk being sold to the industry is around 25 PR's per liter.

[redacted], a New Zealand dairy man in charge for Extension Services for DP, confirms that one of the main problems in improving yields in milk production is the simple supply of water, and clean water as well. Although he believes that buffaloes cannot be enhanced to produce better yields than 10 - 12 liters of milk production, he believes that better handling of the animals at the rural and village level would allow the animal feeding and drinking to be better controlled. He is also convinced that to allow

commercial farming to grow in Pakistan, the need for commercial farm managers could become a problem. These farm managers should be practically trained and not necessarily through long university programs.

Furthermore, [redacted] believes that the departure of Nestle's Executive on the board could be a trend followed by the rest of the private sector members of this organization. He sees some uncertainty in the future funding of the organization from the GOP which could threat the sustainability of its programs.

- I would consider the for resolving of the small and village farmer, to contemplate the possibility of facilitating these farmers with simple fencing for defined areas for the cattle, in which water reservoirs are incorporated and where the animals are free to roam within the corral and drink water at its leisure.

- An organization of this type normally operates not only from public funding but through private sector funding (a levy based on a percentage of the volume of milk processed such as the International Dairy Federation of the US www.idfa.org) and ideally through an endowment fund that is usually started by donations of the service providers to the dairy industry such as Tetra-Pak as well

- It would be very good practice as a part of cooperative dynamics for the key organizations in this sector to informally meet periodically (every 4 to 6 months) just to share experiences and concerns. This is usually attained by having individuals of certain prominence in the sector nationally or preferably, internationally as guests at the meeting. This way all organizations have an opportunity to gather regularly and even though not officially associated, exchange views and experiences with the objective to jointly monitor the trends of the sector.

**METRO Cash & Carry Pakistan**, www.metro.pk [redacted] Buyer Dairy & Frozen category

One of the larger retailers in the urban sections of Pakistan, it is a Hypermarket that operates as a discount club and offers multiple household goods, clothing, foods and other hard goods in a large warehouse building setup. The dairy products sold here are 90% UHT milk covered by three local brands and three imported ones from Germany and two from the Arab countries; one brand of fresh pasteurized low shelf life milk in Pure-Pak® containers (Prima), one brand (Nestle®) of fresh yogurt and Lessee and one brand of shelf stable yogurt imported from Spain (Pascual). Among other dairy products they sell imported cream cheese from Denmark, local butter and imported butter from France and Denmark, a very small amount of locally produced processed cheese mostly for sandwiches and pizza, and a limited line of imported Halal certified processed cheeses.


**Figure 7: METRO - Cash & Carry in Lahore**

In his opinion, the potential for growth of the dairy category is in plain yogurt. He believes that large containers of plain yogurt have high demand and the supply is extremely limited, particularly for large yogurt containers (lKg or more). He has observed that milk consumers do not prefer UHT milk since they believe its processing could have caused loss of the organoleptic characteristics of the product, and thus use it as an ingredient more than for drinking as plain beverage. Profit margins in fluid milk are minimal (2 -3 %) whereas in yogurt and other dairy products it is nearly 20%. Clearly the majority of the METRO - Cash & Carry in Lahore dairy category is in fluid milk. However, he believes that if there was a line of freshly pasteurized milk in plastic jugs in presentations of multiple liters it would be a high selling item. He is so convinced of this that he commented that if he had the funding he himself would venture in milk production and processing of such a product. Sales through the formal retail channel are less than 5% of dairy products in Pakistan.

FARMERS DAIRY, [redacted], owner

It is a commercial dairy farm start up entrepreneur in process of establishing a new farm of Hol-stein cows imported from Australia in a suburb of Lahore, which is a land of 4 acres, through a personal investment of 15PR million in facilities construction and animal acquisition and 2.5PRs in land purchases. Currently, they are receiving assistance of SMEDA and are developing a US dairy design with cooling tunnel set up - a system in which air flow is forced lengthwise through fans that are placed at one end of the stables while at the other end cool water radiators are placed in the air intake, creating a constant flow of air that keeps cows cool during the hot months (June through early September) permitting almost no loss in the milk production by the cows, which common during hot temperature season. At the present time, 40 cows are on their way from Australia and are expected to be in production by July. [redacted] expects to reach a herd of 500 animals within the next 5 years through purchasing heifers, own reproduction and local breed purchases. Even though reproduction is planned to be

through artificial insemination, he considers embryo transplant a much more effective way to get purer breed cattle.

[redacted] is very interested in assisting a dairy farm training program at the University of Wisconsin and has been in contact with USDA, seeking their assistance and financial support. Currently, he is in need of additional funding of approximately 10 million PR for which he still has to apply for a loan from a local commercial bank.

It would be recommended to explore a joint initiative between USAID and USDA or another American agency to consider the possibility of assisting Pakistani farmers in farm training programs in the US in exchange for their commitment to invest in local commercial dairy farming in Pakistan. Furthermore, US suppliers of dairy farm equipment and services could be enticed to participate in a joint effort of this kind since they have a constantly growing market in this country and could have a very important stake in the market if they position themselves at early stages.

**Sunday February 21st**

A meeting was held with [redacted] at Avari Lahore Hotel in the morning in order to present a briefing on the findings from the first week of the assessment visit.

Travel to Karachi in the afternoon

**Monday February 22nd Karachi**

**KARACHI DAIRY FARMERS ASSOCIATION KDFA**, Mr. [redacted], Joint Secretary

KDFA is the largest association of cattle farmers in Pakistan and groups farmers from the five main colonies in the Karachi peripheral urban area: Landhi, Al-Momin, Nagori, Surjani and Bilal. KDFA is a legally established organization with their main offices located in the town of Landhi. Its organizational structure is headed by a board of 29 elected directors whom oversee the organization and secure that its objectives are met.

Among their objectives are:

- Look after the welfare and prosperity of their farmers
- Provide pure and fresh milk to consumers
- Improve national Livestock sector
- Human resource development and capacity building
- Create the environment that will allow members to survive and grow

Furthermore, KDFA represents its members as one body before different government entities; seek after securing the best conditions for pricing, animal health, quality control of feed, protection of indigenous breed (Nili-Ravi & Kundi); improve vaccine quality; secure pest control and control electrical power and water supply rates.

It was originally established in 1962, with land occupied by farmers of approximately 750 acres, and a population of 20 thousand animals. Presently, their farm land extension is nearly 1600 acres. Although an official census has never been performed, it is claimed to have a population of cattle in the neighborhood of 400 thousand among 2000 individual farmers (avg. of 200 animals per farm and 250 per acre). Production is estimated by [redacted] be 3.2 million liters daily (8 liters/head).


**Figure 8: Meeting at Karachi Dairy Farmers Association HQs**

The milk chain for this scheme begins at the farm by two daily milkings. Milk is accumulated in 500 liter open tubs and then transferred into 37.5 liter (40kg) galvanized steel cans which are immediately tightly capped. Within 2 hours of the end of milking, all 40kg cans are picked up by a network of pick-up trucks twice daily. These trucks are generally referred to as “Pekkars”, or mk haulers, that work for an organized establishment of milk collection owned by a master distributor. The milk cans are then delivered to multiple milk selling stores throughout the entire city of Karachi and its surroundings within the first 3 hours of milking. Retailers of milk normally sell the most of their stock within the first hour of receipt, and the remaining is refrigerated and also used for processing into yogurt and other dairy products like Lessee and Ghee. (FDA standards require all raw milk to be refrigerated or processed within 4 hours of the beginning of milking). Some of the distributors have their own stores or chain of stores and some of the Pekkars act independently as haulers. Pekkars negotiate the form of payment with farmers and maintain and constant payment schedule as agreed amongst them. Within 5 to 6 hours, all cans are returned to all farmers in a second visit by the Pekkar.

All fans are washed prior to the second daily milking and the same process is repeated a second time during the afternoon. The majority of milk selling stands are open 24

hours and the process is constant and nonstop seven days a week. The current price paid to farmers by Pekkars is 41 PRs per liter. The approximate number of Pekkars in the Landhi Colony is said to be around three hundred.

Feeding customs of the animals in theses colonies is done in a structured common manner among all farmers. Cows are tied all day exposed to dry feed, and let loose for a specific time period to drink water twice daily. Their daily ration of feed is approximately 8 kg per day (in two daily portions), including cottonseed cake, wheat bran, rice shell, broken rice, bakery waste (old/hard bread residue) molasses, bean mix, mustard oil, sunflower meal, minerals & vitamins; 8 kg daily of greens -usually maize, alfalfa or sorghum - and 7 kg of wheat straw. This gives a total of 23 kg of dry food intake per animal which is complemented by an approximate intake of water of 40 liters.

The breed variety most commonly found is the Nili-Ravi and Kundi, both native to Pakistan but relatively low yield milk producing animals. It is customary that all animals are only kept for one lactation period of 270 to 300 days and then sold to the butcher for meat processing. Only ten percent of the cattle in these colonies are cows and the species are varied between the local breed Sahiwal, Red Sindhi and Cholostan mixed breed with Holstein, Brown Swiss and Jersey.

**Figure 9: Sewage river draining into Arabian Sea showing methane expulsion from water in form of bubbles**

This association is eager to search new capacity building and supports being in new husbandry practices, breed and yield improvement, manure management, energy generation, etc. They appear to be in the best disposition to collaborate in programs that will benefit their colony of farmers and could very effectively spread any potential benefit through a large population of organized farmers and milk producers of close to the equivalent to 10% of the milk produced in this nation. This is a characteristic that must be taken advantage of since it would make any cooperative for more effective and results faster to attain.

During the visit we met with a British entrepreneur who has continued an initiative originally implemented by the New Zealand Government for feasibility studies only. [redacted] is an entrepreneur who is betting highly on the cleaning of this massive environmental disaster and has already set up a micro-digester in a private farm, where they produce sufficient power to supply the power needs of the particular farm.

The most impressive factor of this visit was to observe the effect of all the animal waste in the form of manure that is generated every day. On average, each cow will produce approximately 24 kg of solid waste each day which multiplied by the total number of cows in this colony, converts into 9600 metric tons of waste being poured into the street sewers. This is then diluted with good city water and flows to the Arab Sea. In common terms this volume is equivalent to the load of nearly 40 foot container loads, which, for all five colonies multiplies to a total of approximately 200 containers of solid animal waste being poured into the Arab Sea each day, 365 days per year. This is an environmental catastrophe by any standards which, so far, the GOP apparently has not taken noticeable measures to prevent or correct. A visit through the town showed numerous reservoirs of solid waste in every corner of the town and large amounts in public park areas. Furthermore, we took a drive to the delta of the river and noticed that the fluid that flows near the ocean showed bubbling in the streams. These bubbles are most likely composed of methane gas which is being breathed in by the surrounding villagers and slowly destroying the ecosystem. This is truly sad and unforgettable as seen from any perspective.

Needless to say, the environmental impact on the fishing villages is immeasurable. Fishing villagers are slowly migrating to other lands since the contamination of mangroves and the coastal waters has almost extinguished their prey. Those who choose to stay are being exposed to the daily intake of methane in the air that will considerably reduce their life expectancy. Situations like these are being addressed in other countries and base studies have demonstrated that manure can be processed into bio-digesters and turned into methane gas. There is enough energy produced in the methane fuel from 50 kg of solid waste to light one 100 watt light bulb for a period of 24 hours. With the amount of solid waste being generated in Landhi Colony, they could light up close to two hundred thousand 100 w light bulbs. This means one 50watt light bulb per person for a population of 400 thousand. Furthermore, the residual material can be better applied as fertilizer for land crops which could be used as payment for the feed crops. This dry residual material can also be used effectively for stall bedding in farm stables.

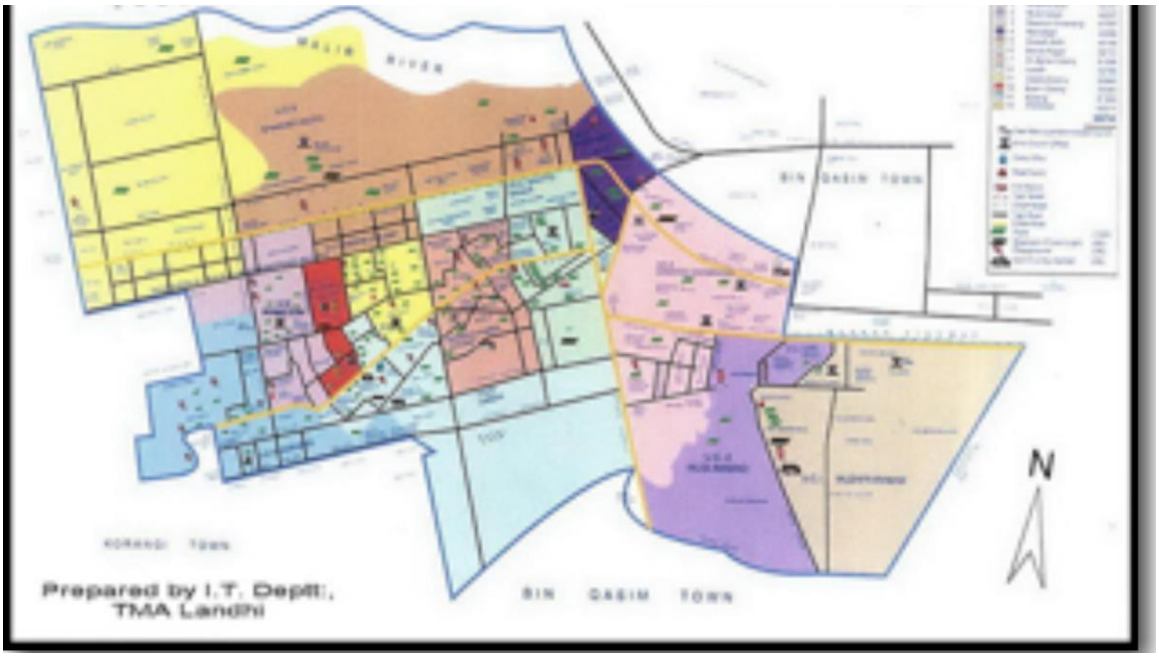



**Figure 10: Landhi Town, www.landhitown.com.pk**

**Tuesday February 23rd Karachi**

**PAKOLA JM DAIRY FARMS (PVT) LTD**. [redacted] , Chief Executives [redacted], Chairman of Standing Committee on Corporate Social Responsibility for **The Federation of Pakistan Chamber of Commerce & Industry.**

Pakola is possibly the single owned largest dairy farm in Pakistan which is owned and operated by a rather humble and low profile businessman who began his farming venture in 1986 with 400 buffaloes. Today he has approximately 9 thousand animals, in a land of 50 acres with multiple stables in series in the outskirts of Karachi. His herd is formed by 1000 cows and 8000 buffalos, of which approximately 4000 animals are milk

producers, the rest are calves, heifers, stud bulls and cattle for meat production. The milking is performed by hand in its entirety, which means employment of 450 male workers who reside in the farms living quarters. Production of milk by this farm is approximately 42 thousand liters daily, 8 thousand of these going to the beverage and milk processing plant next door to the farm Pakola Products Ltd., of which [redacted] is also a partner. The remainder of the milk, 34 thousand liters, is sold to independent distributors and is picked up by Pekkars who take the milk to the numerous milk selling stands throughout Karachi. The average yield per animal is just less than 11 liter per day, being higher for cows than for buffaloes. The selling price for his milk is 40 PRs per liter. As for the cost of feeding his animals, he estimates his costs to be around 350 PRs per animal per day for rations of 40 kg, generating a gross profit on revenues of just over 20% from which he must pay his personnel, energy and water supply costs.

Clearly, this farm generates at least 40 kg of manure per animal, plus waste generated by the rest of the animals which may range to an average of 15 kg per day. This volume of animal waste in solid state is in the range of 23 to 25 MT per day. He confirms that in a 3 kilometer radius of his farm, there are approximately 80 thousand more animals scattered in numerous dairy farms. Some other figures expressed by [redacted] were the general standards on annual yields for cattle in different regions of the world: in the US cows produce an average of 6000 liters per year, in Australia 5000 liters, in Israel 11000, in the European Union 5500, and in Pakistan buffaloes produce only 1150 liters per year.

**Figure 11: Visit to 9000 Animal Farm near Karachi, one of the largest worldwide**

This is clearly a figure that means that Pakistani farmers must commit to breed improvement in order to generate better milking yields. Among [redacted] cattle herd, and common to other farms in Pakistan, it is common to find a small percentage of buffalo animals “Bhens”, or female buffaloes that will produce in excess of 20-25 liter per day. In his farm alone there are approximately 30 animals which he clearly has identified. They are not too fond of the national Buffalo Research Institute in Patoki (out-side of Lahore) since they have very little trust in any government run organization that

supports industry. [redacted], different from farmers in the dairy colonies of Karachi, does not sell his animals after the first lactation. Animals are kept in this farm multiple lactations and insemination is done through natural means by a total of close to 20 male studs among the herd. This has clearly been one of the reasons that his herd has grown to such a large number, making this establishment the largest dairy farm in all of Pakistan.

[redacted] is very interested in cooperating with any program that will bring improvement to breed and yield for dairy cattle in Pakistan. He has expressed interest in financial support to acquire a mechanical 24x2 milking parlor, a new farm he is in the process of developing nearby his current farm.

[redacted]

A visit to a local beverage and milk plant Pakola took place subsequently to visiting the farm. This is a medium size beverage company which specializes in ultra-pasteurizing milk and milk beverages bottled in shelf stable Tetra-Pak® containers. Although this is a long established plant in this country, and formerly a processor of carbonated soft drinks, today it has specialized mostly to dairy beverages and milk. The facility was visited and its equipment and processing rooms evaluated. Capacity and output of this plant is between 50 to 100 thousand liters of of product daily.

It clearly is a relatively modern plant, however it showed evidence of poor food safety practices which could be improved through proper HACCP in house training and certification.

## SOHANA RESEARCH FARM, [redacted]

Under the recommendation of [redacted], a peculiar farm located in the heart of a residential neighborhood of Karachi was visited where we had a meeting with a long time researcher. This scientist is developing research and tests on the handling of animal waste into fertilizer and bio-fuels. He is also performing research on the composting of a local common plant known as “Ipil” (Leucaena Leucocephala), a wild small tree native originally to tropical America and related to the tamarind species. This biological waste when applied to tropical varieties of fruit crops such as papaya, accel-erate growth considerably without the need for chemical fertilization, thus producing an organically grown product. It was recommended [redacted] to approach the local authorities and other organizations in his field for them to cooperate in the development and support of his research, at this time, the Firms program could not collaborate at this time with this type or establishments.

**NAHEED SUPERMARKET & CONVENIENCE STORE**, [redacted]

A second visit to a retail establishment took place in Karachi. This time it was a convenience store in an upper middle class neighborhood. It was observed that all the milk available for sale was UHT milk, cheese offered were only imported feta and cream cheese and locally processed mozzarella and cottage. Other dairy products were butter and yogurt, almost all the butter being imported from Saudi Arabia and Denmark, one local brand of yogurt (Nestle®) and one Spanish imported brand of yogurt (Pascual). The price for cheese was approximately 1000 RPs per kilo (both imported and domestic), in retail units of 200 and 250 grams. This is clearly not a good representation of the typical dairy products consumed by the majority in Pakistan, only an example what the more affluent consumers expect to find in a retail food shop.

**Wednesday February 24th Karachi**

**AL MOMIN COOPERATIVE DAIRY FARMING SOCIETY, LTD, (AMCDFS)** [redacted]

A farmer cooperative society in which, even though they are associated, each acts as separate business unit farm. The association is merely for community representation before government entities and cooperating NGO's as well as for joint purchasing and negotiating selling prices with buyers. This organization is an officially established cooperative formed by 80 farmers in one 50 acre area with a total of 7000 animals, out of which 6000 are being milked. Out of these 6000 milk producers, they consider that up to 5% are high yield buffaloes producing close to 20 liters of milk per day. The remainder of the herd has an average of 8 to 10 liters of milk per day. The total production of milk by this cooperative is recorded to be approximately 50 thousand liters daily.

**Figure 12: Visit to Al Momin Cooperative Dairy Society—a 6000 animals society near Karachi**

The physical set up of the farms is similar to the cattle colonies in peri-urban Karachi, where each farmer has half an acre of land for up to 100 animals and each one is located next to each other in a layout similar to city blocks. Each farm has its own milking area, pens, feeding areas and one main 1000 liter collection tank. All milking is done manually by a staff labor of close to 800 men and no women. Although a chilling tank is not available, they partially submerge the milk in a large water tub to lower its temperature while milking, prior to transferring it to 40 liter steel buckets. Milk is delivered to the selling stores in these 40 kg capped buckets. All animals are loose in closed pens, as opposed to in cattle colonies, and free to drink water in large drinking troughs. The feeding is only done while waiting for milking and during milking. The average feed consumption per animal is estimated to be 20 - 24 kg, and the cost per animal daily portions is 275 PRs. Water intake is estimated to be between 40 and 50 liters per day.

Sales of their milk are made directly with the milk expenders throughout Karachi. The milk is transported twice daily by self-contracted trucks at a cost of 50 PRs per 40kg can. Therefore, the price they get per liter is of 40 PRs net after delivery costs are excluded. With yield levels of 8 to 10 liters per day, each animal generates revenues of 320 to 400 PRs per day after subtracting the cost of feeding. The gross profit margin before water, labor and electrical costs is between 45 and 125 PRs per animal per day. Milk generally reaches the store within 3 hours of the end of milking, where it is chilled and sold to the general public at an average price of 48 PRs per liter.

All solid waste is removed from the farms and placed on the street, where a community pay loader tractor picks up the manure and transfers it to a collection yard located outside of the farm community. From there, it is then sold to local farmers as fertilizer. The farmers are very concerned with the environment contamination factor and are very interested in further exploring other alternatives to dispose of their waste, preferably one that allows them to generate biofuel for self-consumption. Their total output of animal waste is calculated to be approximately 24 kg per animal per day, which for a total of 7 thousand animals, is nearly 175 MT of waste generated each day or nearly 64 thousand MT generated per year. Currently, the liquid animal waste is drying in the surrounding land; however, there are numerous residential projects being built in the area, which, within the next five years will be forced to find alternate manners of disposing of their liquid waste.

The chairman of the cooperative expressed their desire to acquire chilling tanks for all of their farm members, which is a total of 80 chilling tanks of 1000 liter capacity each. They are also interested in acquiring a fed milk and a hay hammer mill to process their own feed concentrate and use their own equipment to chop all the greens fed to their animals. Nearly two years ago, this cooperative experimented with a mechanical milking facility. The venture proved to be unsuccessful due to lack of operative knowledge and poor support from the equipment supplier. Today, such equipment has been dismantled and sold by parts. Despite this failing venture, the cooperative members in the meeting confirmed their continued interest in setting up a new mechanical milking unit and requested any possible aid to attain it. Last but not least in their wish list, is the need for

implementing better waste disposal practices and a bio digester and bio fuel generating system in which area they have already built a rustically made digester to develop trials (but due to the lack of technical assistance, they have not succeeded in concluding any effective or applicable evaluations).

- It was observed that manure accumulation in their pens is excessive and should be removed regularly instead of once per year as they claim the do. This is a clear source of infections and poor health for animals and must be avoided. It was recommended to extract manure from pens every 2 to 3 months.

- Great concern was expressed by the members of the cooperative for the high levels of salt in their water sourced from five wells within the property. These wells have submerged pumps at an extreme depth of 450 to 500 feet. The high salinity of the water causes frequent pump and steel pipe replacement. It would be recommended to develop analysis on this water, which is claimed to have a pH of 7.5 and TDC of 2700ppm. High levels of salt are not necessarily deterrents of high milk production, particularly since their animals are not fed salt as customary in other milking animals' diet. In past research (see reference readings #16) a minimal difference in cow yield was observed only on cows producing over 30 liters per day (the effect on 8-10 liter yielding cows would be minimal). Evidently the salt is being fed to them through the water and since yields are normal to other similar environments in the region, I would say that this is not a problem for the animals but for the metal equipment and parts. A solution to this matter would be implementing the use of desalinization equipment; however, I do not consider it necessary and can identify other aspects worth investing into at this time for this group of famers.

- Mechanical milking equipment may be recommended, however, its source must be of good reliability and it should be set up as a training model farm in more than one of the farmer's properties. Once the farmers practice and operate successfully the mechanical unit, they can gradually acquire their own 2x2 parlors through loans or aid from cooperating NGO's
- It is certainly evident that this cooperative will have a serious problem in the not so distant future in the disposal of their waste. It is recommended to assist them in exploring alternatives for disposing and processing their solid and liquid animal waste.

[redacted]**:** Local Consultant to the American Soybean Association (ASA) and the United Soybean Board (USB) of the US.

He is a long time consultant for the soybean industry in Pakistan, with extensive experience in training and support the animal feed makers of Pakistan. His long career has allowed him to contribute successfully to the introduction of soy meal as an important nutrient in poultry feed as well as the direction of a program of training feed makers locally and the coordination of their training in the US. Among his

accomplishments is the edition of the Handbook of Dairy Nutrition of Pakistan (HDNP), in collaboration with university professors, scientists and experienced animal nutritionists from Pakistan, India and the US. This HDNP is an excellent document regarding nutritional issues of dairy cattle in this country; however, it lacks actual feeding research data on the local breeds. [redacted]a is eagerly interested in helping coordinate any type of cooperation in the form of training, nutrition support, or research that may apply to this component of Firms.

I consider [redacted]'s relationship to the sector, particularly with the network of feed manufacturers in Pakistan, to be instrumental in the development of any initiatives related to feeding and nutrition. There is not sufficient data or studies developed in this particular area with regards to the local breeds of cow and buffalo. Furthermore, being that his experience in editing manuals and books is extensive, he could very well be responsible for tabulating and compiling any nutritional research data into manuals and posters guides that can be distributed among all members of the milk production component of the dairy chain.

**Figure 13: Visit with [redacted] Author of Nutrition's Dairy Handbook of Pakistan**

**Thursday February 25th Karachi**

Engro Foods Limited (EF), [redacted], GM Agri business Unit www.engro.com

EF is a Pakistani consortium of companies in diverse areas such as power generation, fertilizers, PVC manufacturing, food and others. Their participation in the dairy chain is surely in almost every link of the chain. The company has a large extensions service department in which services are provided to farmers in the areas of animal health, nutrition, animal husbandry, collection, chilling of milk in rural areas, and trade capacity building. EF is also involved in farming themselves, with an established dairy cow farm

with an approximate daily production of 32 thousand liters per day. Currently they have 1700 milking animals but their expectation is to reach 60 thousand in the next five years. Their main objective is to become part of this level of the dairy value chain has been based on their need for securing high quality milk supply which is not regularly attained through other farms or rural milk producers in Pakistan. EF also is a milk processor with two facilities, one in Sukkur, Sind and one in Sahiwal, Punjab. Together, both plants process close to 800 thousand liters per day, all through a UHT process and packed in shelf stable Tetra Pak® containers.

EF has a very intricate system of collection of raw milk from farmers, which produce collectively and store milk in nearly 700 chilling tanks of 1000 liter capacity established by EF. These chilling stations serve as rural collection centers where milk sometimes takes up to five hours to reach the chilling tank location. Once daily, routing milk trucks collect the milk from all 700 chilling tank stations and transport them in 40 kg steel tanks to a regional collection center or milk transfer station, where it is refrigerated once more and transferred into tanks and/or into larger milk tanker trucks for further delivery to their two milk processing plants. EF is highly committed to quality, thus, they have implemented simple systems of milk analysis at every level of the collection process. Milk however, is all mixed before arriving to the plant, where testing takes place for some parameters such as total bacteria count (TBC) and presence of antibiotics or somatic cell count. These would not be appreciated nor identifiable to its original source. Therefore, the overall quality of milk has a relatively high TBC which is estimated to be in the ranges of 3 million per unit. The cost of raw milk is currently approximately 40 PRs per liter, and retail price for their finished product is 58 PRs at stores. There is not much margin to work with, so the need for high volume is what incentivizes a profit driven operation. EF's retail products include fluid milk, flavored milk and other beverages that may contain milk as an ingredient.

**Figure 14: Visit to Engro Foods HQs in Karachi**

EF farms are a good candidate to procure US-FDA Grade A certification since they are so concentrated in quality which is required for their sophisticated processing system.

Having a “Grade A” certified farm by third party certifiers would give them an incentive to continue to develop farming in the utmost controlled system, thus, guaranteeing the supply of best quality milk. Furthermore, they could use this fact to in their advertising, making it a commercialized concept to attain customer loyalty.

EF is committed to Corporate Social Responsibility (CSR), since 2007 they have implemented a program at the farm level in cooperation with Nestle® and the United Nations Development program (UNDP). Under a program known as CELDAC http://www.celdac.org/celdac/index.php, EF has helped implement a coordinate as an initiative that has been directed to include and train women within the dairy value chain. In this program they train women and have created a cadre of diploma certified group of young women (known as Lady Livestock Workers (LLW)) that provide services to villagers in numerous aspects of cattle husbandry and animal nutrition and health. These women technical assistants have also become consultant entrepreneurs reaching income levels of 2 to 10 thousand PRs per month. In addition, EF is permanently cooperating at the farm level in other self-financed programs which bring services and trained technical assistance to clusters of villages in the rural Sind region, in the areas of animal husbandry, crop practices and harvesting, local schools infrastructure development.

- I would highly recommend the management of the Firms team to meet with EF and learn more about their social cooperation activities and explore areas of joint cooperation. EF is an established national conglomerate that reaches almost every corner of Pakistan and would be an effective vehicle to reach the most beneficiaries and measure results more rapidly with more effectiveness.

**Friday February 26th Sukkur, Sindh**

**3 Rural Sukkur Milk Collection centers MCC of EF Foods**

In a visit to rural Sukkur, three MCC belonging to EF were visited. Each MCC has one chilling tank of 500 to 1000 liter capacity and serves as a collection point for numerous villagers and other *dodhis* to deliver raw milk to. Each MCC was equipped with one chilling tank and one permanent technical assistant that received each lot of milk. Before being added to the chilling tanks, each lot of milk undergoes a primary analysis for fat, water content, pH and solid milk content. The tank is powered by a fuel power generator at the cost of EF. Every day, the total milk received in each MCC is delivered to EF dairy processing plants by independent contractors (dodhis) in 40 kg steel buckets and in some cases by trucks of their own tanker fleet. Currently EF counts with approximately 700 MCC which serve as collection points of the majority of its raw milk supply.


**Figure 15: A typical MCC owned by Engro Foods near Sukkur**

**Lady Livestock Workers in Rural Sukkur (5)**
**http://www.celdac.org/celdac/index.php**

EF has helped implement and coordinate this program under financing from UNDP as presented in our visit with EF on Feb 25th. Following up our meeting we visited with a group of LLW and one of the coordinator trainers of the program, [redacted] of DP. These women were all enthused of their new professions and felt their life and social participation have drastically changed. All of them were graduates of a 6 week program in which they had attained a profession in such short period of time that it has allowed them not only to feel more included in society but also like a collaborative part of rural a production in which they clearly see they make a difference in the development of their fellow villagers, while earning up to 12 thousand PR per month. They are currently looking forward to further professional development through future programs that may help them become more specialized in specific functions within the animal care aspects. Also, they confirm that there are numerous fellow women villagers that are eagerly seeking to participate in similar programs so they can also find the professional preparation that will grant them a social function and attain economic independence. Most of these women are single and below 25 years old.

- This initiative was clearly a successful program and unfortunately came to a closing. I consider a program of this type an excellent initiative for the Firms program to develop and implement, taking advantage of the synergies established by the UNDP which will allow the continuation of an initiative with notably large and successful results. This includes a great benefit for women in

rural Pakistan, an important aspect of the program. It would be advantageous to link up with the private sector companies that participated in this initiative and explore possibilities to continue the program forward as part of the three year strategy.

**Figure 16: Meeting with Lady Livestock Workers in a village near Sukkur**

## Engro Dairy Farm [redacted]

A visit to EF's only dairy production farm took place after a long drive from from Sukkur. Located near the desert, south of the city, this three year old farm is a rather modern facility with technology found in any US or EU dairy farms (including two 30K liter chilling tanks plus two plate chillers which chill the raw milk immediately after milking and pump it into the chilling tanks, a double chilling concept unnecessary but acceptable) and counts with 1600 cows, of which 1350 are currently in milking. The farm is still under development of expanding their facilities to allow a maximum number of milking animals of 3000.

Most of the cows are a cross bred between Holstein and Swiss Brown with local breeds. Average yields in this farm have reached 22 liters; however, due to an infestation of hoof and mouth disease in the recent months that affected the entire herd, the current yields are around 16 liters per cow. Cows are free to roam in yards where they are fed regularly and are free to drink as much water as they wish. The farm manager has been with the farm since its inception and he is a great professional with good experience in the field; however, all of his experience is strictly based on his work in this farm. This farm was originally designed by [redacted], the dairy consultant met on Feb 15th, however due to differences between EF and [redacted], they ended their relationship about one year ago. All of the milk produced in this farm is delivered daily to EF's Sukkur plant. The feeding averages are around 40 kg per animal per day, of which 25 Kg are mixed concentrate and 15 Kg is green fodder, at a total cost per ration per day of 350 PR's. Since the current production is of 16 liters and a selling price of 35 PRs, the

operation is currently profitable even after adding regular operating costs. Thus any increase in animal yields such as back to their regular 22 liter per day average, would make this investment largely profitable.

**Figure 17: Visit to Engro Dairy Farm**
**Engro Milk Processing Plant Sukkur**

Due to time constraints as a result of the extensive distances covered in such short periods of time during this assessment period, a rather short visit to EF's Sukkur dairy processing plant took place. During the visit we were greeted by the plants HR director, [redacted], since the GM was occupied with a group of plant suppliers. This plant is one of the newest plants for dairy processing in Pakistan and one of half dozen plants that process milk for the formal retail market. All the processing is based on ultra pasteurization and packed in Tetra Pak containers. The plant's initial investment was of approximately three million US$ and today employs approximately 300 people, who process approximately 300 thousand liters of milk daily. A brief visit to the plant demonstrated that the technology and practices applied in this plant are of high standards. The philosophy among employees in the company is very much in sync with the company mission and objectives, which strive in processing the highest quality product to provide the best and safest dairy product to the Pakistani consumer.

**Saturday February 27th**

Meeting at the Hotel with Firms Karachi office director [redacted] at Avari Towers Hotel during the morning

Travel to Lahore in the afternoon

**Sunday February 28th**

[redacted], brief meeting at Avari Hotel took place in order to discuss a possible cooperation model with [redacted] in the area of nutrition research for the Punjab region. [redacted] is interested in being contracted to coordinate such research activity since he has ample experience in the field and in the region and knows well the players in this link of the dairy chain.

**Dairy Pakistan**, [redacted]

He is in charge of the implementation of bio digester in rural farms in the Punjab region following is the typical bio digester model being implemented which has been don successfully in over 100 farms.

**Monday March 1st**
**Nestle Pakistan Limited,** [redacted]

A brief visit to Nestle's HQ in Lahore took place, where a Brand Manager greeted us. It was apparent the [redacted] was not aware of his company's social cooperation activities and after a descriptive meeting, he concluded he should refer us the person in charge of Corporate Cooperation. He has kept some communication after the meeting with Ms. [redacted] and we are still expecting to get the information. Nestle is the larger industrially milk processor in Pakistan, in addition, they are currently importing nearly 8 thousand MT of dry powder milk per year. In total Nestle is processing close to three million liter of milk per day in two plants (Lahore & Kabiwalla), and is currently the largest processor of dry milk powder nationally with a total of 4 drying centers.

Out of all the meeting developed during the visit, this was the one that demonstrated the least cooperation from a prospective partner of the private sector; however it is not an uncommon posture of large multinational organizations in developing countries when approached for this purpose. I believe eventually they will get closer when they see participation from other private sector players and then we will be able to develop joint strategies with Nestle.

**Halla Dairy-** [redacted]**;** [redacted]**, CEO**

This is a Dairy Farmers Association processing facility in Lahore, which collects and processes milk from approximately 30 thousand farmers of nearby Lahore. This was a program originally established by a German initiative (GTZ) in the early sixties. Originally it started with clustering 25 villages around Lahore whom began producing and collecting milk as a cooperative and selling it jointly as one entity to

industrial processors. In time, they grew in size and volume of milk and through additional donations, established a processing facility in urban Lahore where today they process nearly 100 thousand liters of milk originating from 30 thousand households that deliver their milk to numerous MCCs property of Halla (this figure has experienced a reduction of 35% in the last three years). Their main products currently processed are shelf stable ultra pasteurized milk in plastic pouches, yogurt and dry milk.

This entity also provides to its supplying farmers and members: extension services, village women training for husbandry practices, health insurance and training in general on aspects related to milk production and human health. So far they have trained over 3 thousand LWW who are currently earning around 4500 PRs per month. [redacted] has operated under the leadership of [redacted] since 1989 who reports to a board of directors formed by the farmers whom are elected to serve for defined periods of time. [redacted] expresses serious concerns about the current general situation of [redacted]. He has observed a reduction of milk volume being processed from 400 thousand liters at its peak in the last five years. He claims that today, farmers are less attracted to milk producing and are selling their animals due to the high value they have which makes it more attractive than milk producing. Currently, they are paying the farmers who deliver milk to the MCC approximately 28 PRs. [redacted] also agreed that the feeding practices for rural cattle are deficient and that water intake is minimal, thus, causing low yields in cattle. He attributes the main reason for this poor practice among farmers to the low availability of water or clean water in the rural areas where his farmer members currently reside.

**Tuesday March 2nd**

[redacted] is an agro industry Independent consultant who has graduated from George Washington University in the US with an MBA degree. She is based in Islamabad and with extensive experience in similar programs in dairy and agriculture development in the Mid Asia region. [redacted] is being considered as a possible candidate for Sector Lead - program coordinator position. [redacted] was interviewed jointly with Firms' Gender Advisors [redacted]. Due to [redacted] recent clinical situation, she had to be attended by the office staff and the meeting was postponed to Saturday March 6th via Teleconference.

[redacted]

This is a private enterprise that is a very important and serious supplier of cattle farmers in the province of Punjab. His services range from semen supplier, feed blender and supplier, cattle importer, equipment supplier and animal rearing practices trainer. [redacted] is a professional entrepreneur of German descent, and closely related to a former CEO of Nestle® Pakistan.

- [redacted] presents all the characteristics in a business person that would generate high and optimum results from any joint activity developed. His interest is to collaborate in the development of an animal nutrition exercise as presented in the recommendations of this report, thus, having him participate as a facilitator may be worth considering.

### [redacted] Independent Consultant for Model Farms

[redacted] was requested to prepare a proposal model concept for a turnkey farm that would be sale-able to any interested investor wanting to get into the commercial diary production enterprise. The objective of this request was to evaluate [redacted] ability to put together a comprehensive commercial farm initial establishment and 18 month business plan. A plan of this kind would be evaluated and some of its components such as technical assistance, training of farmers and farm managers, crop seed, etc., could be considered for financing by Firms. The ultimate objective will be to prepare a campaign among local businessmen and business consortiums to invest in a well defined and assisted program of commercial dairy farms. In this proposal, [redacted] will act as the coordinating and training consultant for which he will determine to what extent. This program may or may not be developed jointly with SMEDA, which will be determined at the time of implementation of the strategies.

### Jassar Farms (Pvt) Ltd., [redacted]

After a comprehensive power point presentation made by [redacted], it was clear that there is a need for semen for artificial insemination to benefit the entire livestock sector in Pakistan. The semen production and embryo transfer private enterprise is currently developing a new facility for the production of 300 thousand doses of selected semen for sale to the general dairy cattle sector. [redacted] main interest is to obtain funding from Firms to extend their developing enterprise to produce instead of 300K, a total of 5 million doses of frozen semen. Although it is evident that semen availability is necessary in this country, breed improvement is a proposition that falls within periods of time that are more extensive than the period of time Firms project has for development of its initiatives. Therefore, any breed improvement practices that may be applied may not have the results desired nor required for the project to present as its accomplishments. Based on this argument, it was requested from [redacted] to reconsider his proposition to one that would have some benefit for the livestock community as a whole if any funding is granted.

Further discussion took place with [redacted] during the days from March 8 through 11th, where he proposed a new model for financing by the firm's project. However due to the characteristics of his proposal which requested substantial funding for his venture, the following reply was sent:

*Dear* [redacted]

*Thank you very much for the information and your continued interest in our program. I have reviewed your proposal and find it is a comprehensive program that solicits a funding from Firms in an amount in excess for 14 million US$.*

*Although our program is for supporting small and medium enterprises in Pakistan in various sectors, we are not in a position to finance enterprises in liquid funding. Our program will be investing in activities that are in the form of technical assistance, and at times, possibly acquiring minor goods that may be necessary for the implementation of our programs; however in any case, the assistance to be provided by the Firms project will be limited to a small percentage of the entire venture. All programs must be completed by June 2012 and must have extensive benefit to the sector in which they are developed.*

*Thank you for your interest in cooperating with our programs, however we regret to inform you that Firms cannot be participative of the initiative you are presenting.*

**Wednesday March 3rd**

**[redacted] Punjab: [redacted] (plus another Major)**

CEBG is a very well established semen production center of Holstein and Holstein mixed breeds owned by the Military Forces of Pakistan. Run very professionally and in a business-like manner, with high technology equipment in use, it currently produces nearly one million semen doses and 5000 embryos per year. These semen and embryos are distributed through the entire country through their own staff of 38 extension service specialists. The cost per semen dose is 50 PRs and in cases the technicians are allowed to charge higher prices, which is additional income for them. This difference is substantiated by the additional cost the technicians incur in delivering and applying artificial insemination to the farmers' livestock.

Currently their effectiveness rate of insemination is at 60%, however, this includes males and females born. [redacted] is very interested in obtaining a new high technology device that will allow them to produce gender defined semen doses. This will increase the rate of female born calves by 100 percent, and even though their total effectiveness rate will possibly be maintained, there will be a warranty of female calves being born of close to 100 percent of those effective inseminations. The cost of this equipment is approximately $120 thousand. A proposition worth considering for Firms as long as it is developed jointly with a program in which the CEBG provides semen doses to the beneficiaries in this dairy component of the program.

- In addition, since they currently they lack a well developed data bank with regards to specific locations where the semen or embryos are applied, nor the statistics of the farmers they serve; it would be worth pursuing past proposition

by NORTEL to provide mobile telephone equipment to all 38 extension service technicians, so they can photograph with GPS identifier equipment telephones and that allows them to submit the data via messages to a central data bank. This way the location of the application and other farmers' information can begin to get stored and eventually be able to better document a livestock map which currently is not available even at the Pakistan Census office.

## ENGRO DAIRY PLANT, [redacted]

A visit to the second dairy processing plant owned by EF. This is a large facility than the one in Sukker and it also includes a newly installed state of the art ice cream facility. This plant supplies itself of milk from MCC that have been implemented through threw Dairy Hub program developed jointly with Tetra Pak and De Laval equipment manufacturers. Currently they work with nearly one hundred MMC. These centers operate exactly like the ones visited in Sukker and presented in a previous section of this report. The processing capacity of this facility is of nearly one million liters of milk per day, and today they are operating at approximately 50 percent of its capacity, so there is room to double the consumption of milk by this plant with only increasing their labor force required to attain satisfying processing the current capacity deficit.

A visit of the industrial facilities took place, while which a few US dairy standards recommendations were provided in order to attain higher food safety standards. The most important observation to make was regarding the flooring at the plant, which presented numerous areas where the epoxy coating on the floor is peeling off. This is a result of applying the epoxy to a floor that was not completely cured or dry. Repairing this situation is very difficult since any repair works must be done under completely dry conditions which is almost impossible to attain in a dairy plant while in process, and stopping process is close to impossible. However, the repairs being performed showed very good results and it was recommended to continue the process or repair in such manner.

It is very clear that EF is committed to high food safety standards as well as to GMPs in their food processing plant; this is a guarantee that any joint activities developed with EF will also have the security of maintaining high standards and will most likely generate high results.

**Figure 18: Engro Foods Dairy Processing Facility in Sahiwal**

**Thursday March 4th**

SECRETARY OF LIVESTOCK & DAIRY DEVELOPMENT (SLDD) Hon. [redacted], Secretary; Mr. [redacted], Deputy Secretary (plus two other member of the Secretary)

A meeting with the Secretary and 3 of his personnel took place in their offices in central Lahore. During the meeting, a comprehensive presentation was made of the state of their secretary regarding the dairy and livestock current situation and activities. Undoubtedly the programs, activities and level of support by this secretary are commendable and complete. In summary, the following aspects were gathered form this meeting:

**Drivers of the institution:**

- Supporting the rural farmers
- Enhance productivity and improvement of genetics, nutrition and husbandry
- Better operability between local markets and regulatory environment
- Support development of private enterprise opportunities in thir sector
- Provide high quality products
- Apply effective research and technology Priority Areas for development

**Priority Areas for Development:**

- Develop effective Surveillance and Control of the sector
- Enhance production
- Better product management through application of better Food Safety Standards
- Development of Human resources for extension services
- Develop better support services

The Secretary strongly believes that Pakistan must have a strong program to train farm managers so the need for importing them is minimized; on the contrary, he believes that the potential is large enough that once programs are established, Pakistan can export farm managers to other countries in the region. They do believe that there is great need for local breed improvement in milk production to allow more commercial farmers to take part of the dairy chain. Also they believe that there has to be new programs on nutrition research in order to obtain better production based on better nutrition for milk production. Currently they are funding PDA in order to have more and better extension services for farmers.

They expressed that they have great needs for cooperation in the following areas:

- Establishment of MCC to create more and bigger milk production and collection clusters.
- Privatization of extension services for farmers
- Establishment of more processing facilities by groups of farmers MPG
- Increasing the water resources for rural farmers.
- Training LLW for servicing of rural areas.

Currently, this institution has a program under implementation in which during a 5 year plan farm land will be leased out to private commercial farmers in lots of 500 acres per farm under 50 year lease agreements. This program should be considered when developing commercial farms under our program in order to be able to utilize this land leasing opportunity for new commercial farmers.

Finally it was confirmed that on march 15th a document demonstrating the current livestock state in the province will be published, a document that should be obtained by FIRMS and incorporate in the strategic plan being developed and presented in this report.

**Exit Briefing Meeting** with [redacted] a review of the conclusions made under this consultancy was presented and agreed that the final document would be presented by March 19th 2010.

Travel From Lahore to Abu Dhabi at 8pm

**Friday March 5th**

Travel from Abu Dhabi to Miami

**Saturday March 6th**

Interview via teleconference with [redacted] took place. As a result of the telephone interview and reviewing [redacted] qualifications it was evident that [redacted] has the professional expertise and capacity to lead this program component, however there

may be some time limitations for her which should be discussed at the time of further interviews with the HR personnel at Firms.

Other existing organizations within the dairy value chain established in Pakistan that were identified but not able to meet with due to lack of participation with the assessment visit were:

**PAKISTAN DAIRY ASSOCIATION (PDA) (Lahore)-** Could not meet since is an association formed by 10 of the largest processors & service providers to the sector including Nestle, Halla, Halib, Engro, Prema, Mellac, Okara, Tetra-Pak, ProFarm, etc.

**Farmers Association of Pakistan FAP-** Could not meet with due to lack of presence in the sector and difficulty of finding a contact person to provide information in their ventures.

# 3.0 CONCLUSIONS AND RECOMMENDATIONS

## A THREE YEAR STRATEGY FOR STRENGTHENING OF THE PAKISTANI DAIRY SECTOR

### General Conclusions

1. Firms Dairy Sector Program Website
2. Installation of Chilling Tanks (CT) in new MCC points.
3. Feeding and Nutrition Efficiency Research
4. Promote Animal Water consumption.
5. Loose Animal Pens & Sponsored Animal Pens
6. Farm Manager Training Programs
7. Commercial Farm Model (Private Investment)
8. Cheese making, a Women's tradition.
9. Ladies Livestock Workers, replicating the CELDAC model
10. Anaerobic Digesters in Colonies and Larger Farms
11. Farmer Clusters Mpg's Establish Central Milk Collection Stations
12. Research for Breed Improvement.
13. Industrial Mozzarella Processing Plant for Export
14. Website Development for KDFA & others
15. EPA Warning
16. Other Recommendations

All recommended activities are presented in order of priority

## 3.1 General Conclusions

All conclusions and recommendations presented herein are the product of the interpretation and tabulation of thorough evaluations and analyses of the conditions and practices observed in the multiple visits and interviews developed during the three week period in-situ. At all times, these analyses and evaluations were based on the following main objectives:

- improve animal production yields
- increase income for rural farmers
- increase sanitary production and processing of milk
- incorporate women into value chain
- implement good practices for :
  - ✓ farming,
  - ✓ animal husbandry
  - ✓ milk production
  - ✓ milk products processing and handling

It was found that there are several public organizations in Pakistan (SMEDA, PDDC, LDDB) in addition to the Secretary of Livestock and Dairy, that are currently extending services and implementing programs independently and in some cases jointly with the private sector. Furthermore, there are three government run organizations that are dedicated to the development and improvement of animal breeds. However, although there are several feed providers and nutrition specialized enterprises, none have formally developed any studies related to finding the lowest possible feed portion and formulation that would give the highest milk production yields. It was a common practice to feed the animals set amounts of food daily, regardless of its relationship to milk production. A very predominant custom regarding the feeding of milk producing animals was the severely limited consumption of water in their daily diet. Regarding the processing of milk, it was found that over ninety percent is distributed and sold to the public in raw state (most people will boil milk before consumption as constant practice), the rest is processed by a dozen formally recognized industrial processors whose milk and milk products are distributed through the country by a network of well established distributors (logistics providers) and retailed to the public by a limited number of supermarkets and conveniences stores. Pricing of these two channels have nearly a twenty percent difference; however, the majority of Pakistani people prefer to purchase raw milk and boil it before consuming or processing it than buying industrially processed milk or milk products.

The effectiveness and success of the activities proposed in this document will be crucially dependent on how efficient and effective we are in selecting and appointing the proper Sector Lead professional in charge of this component in addition to selecting the appropriate group of beneficiaries. The proper evaluation,

search and consideration to past and present experiences and skills as well as the relationship and acquaintance with the sector players of candidates will be integral. Clearly, we will not be able to have a global impact in the sector as a whole in the short period of 36 months; however, by implementing the concept of setting up replicable models, documenting and publicizing all research and exercise results, and properly documenting all benefits attained from every developed activity, we will have a process of “planting seeds” or “training trainers”, whom through the mere success of the different activities, such will be of automatic interest to others and will provide sufficient motivation for the replication of the concepts and practices developed.

This will help them attain positive results in their activities and revenues. Thus, the beneficiaries and partners selected must provide enough confidence that the results of the activities and models applied will be at the reach and exposure of other members in the value chain. When research exercises are developed, the proper tabulation and presentation of reports in manuals, posters and brochures must be also be developed. When structural models are developed that are growth permissible they will act as models for future reproduction and expansion. Furthermore, every recommendation presented should be based on an application of carefully selected beneficiaries or groups of beneficiaries from the different links of the chain. All of these factors will guarantee the multiplier effect we will need for the maximum impact to the sector from this three year strategy. Such an impact will be reaching satisfactory levels of yield improvements and income increments for the most possible small and medium members of the value chain. These factors will also want to be repeated going forward in the development of the dairy value chain of Pakistan.

We must take into account that Pakistan does not have a structured system of surveillance and control of milk production and processing federal regulation. Although there is a milk production and processing inspection department, it is neither the most efficient nor sufficiently large in staff to cover the entire territory. Proposing changes or new recommendations to the present system of dairy control are not considered in this document due to the fact that the political implications and time of development for any policy reform to present laws would require far more time than three years. Thus it would be accurate to state that milk consumption in Pakistan presents a relatively high risk to humans.

Regarding educating milk producers, it was observed that formal education is relatively absent with the exception of a few universities that offer formal certificate and degree programs that require several years to complete. Most of the professionals who graduated from higher education academic institutions will most likely end up performing functions that are not necessarily those they prepared for and definitely will not go into the rural areas to permanently perform their pro-

fessions (most stay in larger urban areas). This leaves a wide gap in the improvement of animal husbandry and farming practices since those who remain responsible for these activities are the same uneducated rural villagers who acquire their skills from tradition, which are not necessarily within best or updated practices for the objective sought. This is one of the factors contributing to the reason why development of the dairy sector at the rural level is extremely limited in Pakistan.

## 3.2 Certification and Standards

It was evident during the exploratory period that milking practices implemented by manual milkers in the different farms visited were not necessarily in compliance of good milking or hygienic practices. International standards require that milkers thoroughly clean the animal's udder and wash their hands between animals. This is clearly not the case in Pakistan, where most milkers are men and their hygienic habits leave much to be desired and are not necessarily in accordance with good food processing practices. It was common to see men smoking while milking, take breaks for relieving themselves of their human necessities without washing their hands and handling buckets with dirty handles or in unsanitary manners. Numerous milk buckets are splashed by cow waste during milking and at times particles of manure drop into the milk. These aspects should be taken into account when implementing any of the good manufacturing practices training activities proposed in the fore coming recommendations.

Although this report presents multiple recommendations for the betterment of the sector in general, this evaluation has not taken into consideration nor addressed the very important issue of milk quality during this exploratory period. This has been due to absence of laboratory and analysis facilities and the high demand of milk that cannot allow any waste due to poor quality or poor nutrient content. Although it is not good health practice to consume milk whose quality is not guaranteed, it is a common practice in Pakistan. The physiological effect on humans due to this fact will be observed in defects in babies at birth and levels of tuberculosis or brucellosis in humans. It was commonly commented by farmers that the observed mastitis problem in animals is in a range of 30 percent, which means that those animals that are being treated chemically are producing milk that with transport, the contaminants are being consumed by humans(since boiling or pasteurization does not eliminate such contaminants). Furthermore, shelf life of milk is greatly reduced and yield by product production is lower from treated cow milk. However, since milk is generally consumed in its entirety within 24 hours, and milk products are relatively minimal (no cheeses), these two factors are ignored or not even perceived or have an impact in the value chain.

It may be premature to pretend to establish international standards at a broad level in Pakistan. International standards are normally required when exporting products to other more developed countries; today Pakistan is distant from becoming a

recognized exporter of dairy products, even though through proper negotiations and investment a mozzarella industrial facility could be in sight one which will have to comply with most international standards in order to penetrate foreign markets. Pakistan today is still in a stage of raw milk trading, with very limited public infrastructure for quality control and surveillance of milk production and processing. The geographic extension and distances preclude the weak national system from performing an effective task in inspecting farms and processing center. There are however a select group of institutions member of the provincial and federal governments that are performing excellent work in supporting the sector and possibly these in a not so distant future could be the objective entities that should be collaborated with in designing and applicable system for implementation of Standards and certifications.

Despite the aforementioned facts, it is highly recommended for the industrial dairy processors in Pakistan to secure food safety principles in their manufacturing facilities. The most optimum system to implement based on international standards is the HACCP plans. The US dairy regulations offer a HACCP standard applied specifically to dairy. All established industrial processors must begin to implement these quality assistance plans in their facilities in order to secure consumer health.
In summary, nearly 80 meetings and interviews were developed. These incorporated practically every member of the dairy value chain, including not only producers, transporters, processors and retailers, but also service professionals from the medical, nutrition, government control, equipment suppliers, and other service providers to the dairy value chain and processors. The following table presents the distribution in categories of all meetings and interviews.

**Table 8: Distribution in categories of all meetings and interviews**

| | Category | Total |
|---|---|---|
| 1 | Industry Specialists | 10 |
| 2 | Commercial Dairy Farms | 12 |
| 3 | Industrial Processing Plants | 5 |
| 4 | Sector Associations | 5 |
| 5 | Rural Producers and Villages | 7 |
| 6 | Government Institutions | 6 |
| 7 | Peri Urban Cattle Colonies | 2 |
| 8 | Milk Collection Centers | 7 |
| 9 | Universities & Research Centers | 3 |
| 10 | Retailers | 4 |
| 11 | Total Meetings developed | 59 |
| 12 | Total Industry Professionals and Individuals interviewed or met with | 70 |

The following table presents the current pricing situation in Pakistan for the entire commercial dairy value chain, presenting prices in ranges which depend on the

precise negotiations developed between the trading partners. It is important to point out that as of march first, the GOP authorized an increase in price of 4 PRs per liter of milk, which has affected the entire chain proportionately.

**Table 9: Milk pricing in Pakistan per liter as of March 1st 2010**

| | P. Rupees | Category |
|---|---|---|
| Sale of raw milk by rural farmer to dodhis | 25-28 | Rural Producer |
| Sale of raw milk by farmers or dodhis To mc/processors | 28-32 | Rural Producer |
| Sale of raw milk from cattle colonies & assoc. To “pekkars” (pickers) or milk stores | 38-41 | Commercial & Peri Urban Producer |
| Sale of raw milk by dodhis or “pekkars” To urban milk shops | 40-48 | Trader or Transporter |
| Sale of raw milk to public at milk shops | 48 - 52 | Retailer |
| Sale of industrially processed milk To formal distributors | 48 - 52 | Processor |
| Sale of industrially processed milk to retail stores | 54 - 58 | Formal Distributor |
| Retail sale of processed milk in aseptic containers to public in formal retail stores | 58 - 65 | Retail |

Following are the recommended activities for implementing a 3 year strategic plan for support and development of the Pakistani diary sector are presented in order of priority. Furthermore, all of the recommended activities should be developed strategically under the direction of the Sector Lead responsible for their implementation and development; and under the supervision of the International Dairy Sector Consultant responsible for the design of the strategy. The following tables present a timeline for the preparation, implementation and development of each recommended activity as well as the measurable objectives expected to attaining through the proper implementation and development of these.

## 1. Firms Dairy Sector Program Website

| Table 10: Chilling tank installation program for increase farmer production and income and higher quantity of quality milk processed- Individual tank cost and impact calculation | |
|---|---|
| ACTIVITY COMPONENT | 3yr. COST (PRs) provided by: |

| | Processor | Firms |
|---|---|---|
| Supply and Installation of 1000 Lt. CT in Rural Areas' MC's | | 400,000.00 |
| Space rental of tanks permanent location (4250 PRxl2mo.x3yr.) | 153,000.00 | |
| Maintenance for optimum operation of CT (4250PRxl2mo.x3yr.) | 153,000.00 | |
| Supply of permanent power to CT via generator or City supply (4250PRxl2mo.x3yr.) | 153,000.00 | |
| Full time milk collection technician in each MC (12750PR xl2mo.X3yr.) | 459,000.00 | |
| Analysis materials and supplies and recording of Milk collection (4250PR x 12mo. x 3yr.) | 153,000.00 | |
| Cluster of farmers in each MC serviced by Processors Extension Services Network personnel and/or by LLW from this program (12750PR x 12mo. X 3yr.) | 459,000.00 | |
| Payment of transport of 500 daily liters of milk to their regional milk collection center and plants (1PR x 500ltr x 365day x 3yrs) | 547,500.00 | |
| 36 month Investment per CT | 2,477,500.00 PR (US$ 29,147.00) | (*) |
| Distribution of Investment per CT | 2,077,500.00 PR (US$ 24,440.00) | 400,000.00PR (US$4,700.00) |
| Total 36 mo. Investment (500 CT) | US$ 14.57 Million | |
| Total Allocated Investment (500 CT) | US$ 12.22 Million | US$ 2,33 Million |
| Investment Proportions | 84% | 16% |
| TOTAL IMPACT CALCULATIONS- (first 3 yrs.- 500 CT) | | |
| New Milk going from informal to Formal Processing - Total Impact | 273.75 Ltr. (Million) | 8,212.5 PR (Million) |
| Current Annual Revenue received per farmer via informal value chain (10Ltr/dayx25PR/ltrx365days) | 91,950.00 PR | 100 % |
| Total Additional income per farmer per year (5PRxLtrX10Ltr/ dayx365days) | 18,250.00 PR | 20 % |
| Total Farmers benefited per year (10/Ltr. per farmer) | 25,000 | |
| Total additional revenue generated by farmers as a result of this (*) Exchange rate used US$1.00 = 85 PRs initiative | 1,336.85 PR (Million) | US$16.103 (Million) |

As in any commercial enterprise, this Sector strengthening program being developed by Firms, will require to have an established interactive website. In it, all activities, trainings, programs, assistance research results, etc. are to be published. This will give the program complete exposure and faster accessibility by all member of the value chain. It would publish research results, as well as new

opportunities for incoming member into de dairy chain. In general, a site that should be inter linked with all the other organizations in the country cooperating with the program. Duplication of efforts must be reduced at all times.

**2.** Installation of Chilling Tanks (CT) in new MCC points

Although contributing with hard goods or assets directly to beneficiaries is neither USAID's intention nor practice, it would be recommended to evaluate the possibility to consider a proposal to this effect in which the installation and operation of chilling tanks are supplied by Firms under a three year commitment by a private sector processor. Following is 3 year model for this strategy.

This initiative must be developed jointly with larger milk processors such as Engro, Nestle, Prema, etc. where a structure operational program is developed in which the following aspects are included:

- Installation of 500 CT units with capacity of 1000/1500 Lt.. each in Rural Areas MC's
- Processor facilitates space and permanent location to be installed, power supply and management resources.
- The cluster of farmers per MC would be serviced by Processor Extension services network and/or by LLW from this program
- Processor pays for transport of milk to their plants or regional milk collection center
- Processor commits to a fixed price purchase of milk from rural producers no middlemen.

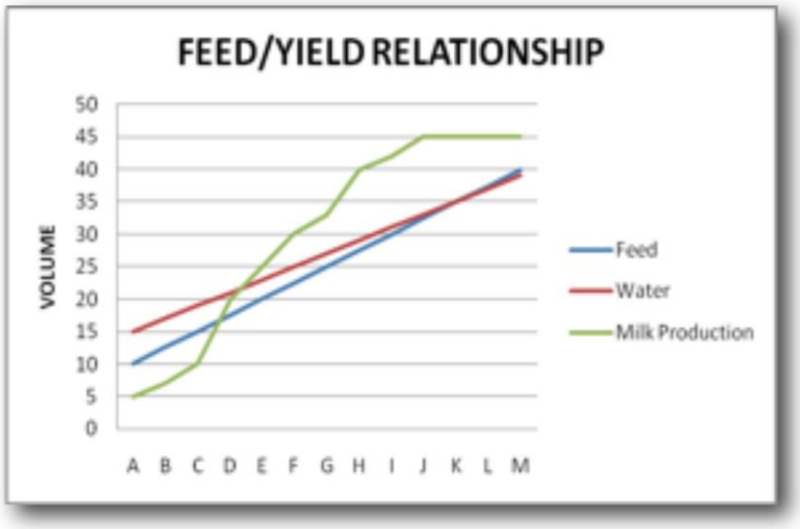
Processor will commit to increase its processing volume y the volume collected in all new CTs. This projection table assumes a price for milk per liter paid to farmers in rural areas is 25 PRs, there have been cases where the price is lower, furthermore, the price for purchase by processing plants has been observed to be up to 35 PRs in the peripheral urban areas of Lahore and up to 40 PRs in the peripheral urban area of Karachi. The costs of operation and human resources were obtained from the meetings and interviews with during the visit.

**3. Feeding and Nutrition Efficiency Research**

It was evident in all visits to farms that animals are being fed larger than normal quantities of dry matter. Most rations observed were from 25 to 40 Kg. of dry feed and greens; however, the yields in all cases were between 6 and 15 liter/Kg of milk for all farms. From any conventional practice on animal feeding, the larger the portion, the

higher the yield; larger amounts of food should help produce much larger volumes of milk. It would be necessary to develop further research in which different formulation of feed ingredients are mixed in order to find an optimum composition amounts and ration size given to animals, in order to identify at which mix they will produce the same amounts of milk they currently are, or increase their production yields. In either case, the results would be a reduction in the cost of feeding and/or an increase in production yields. Both cases would present an improvement in the marginal profit income for farmers. The average feed cost found was approximately 8.75 PRs per kilo of food. In Pakistan, animals are being *overfed dry matter and underfed water*. The appropriate and optimum relationship between these two factors and milk production must be identified.

Through the collaboration of [redacted] in Punjab, a program of this type could be implemented. The research results would be tabulated and compiled on to manuals and display posters that can be distributed among all members of the dairy value chain. For the purpose of attaining additional funding for this initiative, cooperation from the ASA could be sought as well as long as Soybean meal is used as ingredient into the nutrition formulations to be developed.




An exercise of this kind is applied to the various local breeds and mixed breeds; parameters are measure over defined periods of time, where milk production volumes against daily volumes of food intake are compared and analyzed (see chart below). The These parameters include but are not limited to animal weight, weather factors, water intake, fodder and feed absolute volume, nutritional components and proportions of different feed formulation, etc. All of these will have an effect in milk production and such exercise will help us arrive to the lowest necessary amount of food and the optimal formulation to obtain the largest volume of milk produced by each variety of breeds. The

result of this will not only be a possible increase of milk production but a considerable reduction on the feeding cost of the cattle allowing higher profits for all farmers in general.

The recommended period of time is a six month period, which if started in the month of July, it can comprehend two months of the wet season, two months of transition season, and two months of dry season. This would provide a good scenario of real life characteristics, thus providing well applicable results.

4. **Promote Animal Water consumption**.

The amount of water dairy cattle drink depends on the animal size, quantity of dry matter consumed, temperature and relative humidity of the environment, quality and availability of the water, amount of moisture in its feed and the sodium, salt and protein content of the diet. If cows have inadequate water intake, we may see signs showing up such as firm and constipated manure (common in Pakistan); low urine output (frequent in farms where animals are tied); infrequent drinking; high packed-cell in blood; dehydration from toxins; and/or fever. Traditionally in the US, a cow that produces 20 liter per day consumes approximately 4 - 5 times that volume in water at temperatures between 60° and 70° F. Average water daily intake by the dairy cattle evaluated during the visits to farm was approximately within these parameters; however animals in rural farms and villages were not possible to measure its water intake; however is common knowledge that these produce between 2 to 3 liters of milk daily. Thus providing the proper environment for these animals with sufficient water will allow them to have an increment in their yields of in high percentages. Proper education and assistance in this area alone will have a notable effect in daily yields for dairy cattle in Pakistan. In addition, troughs design alone is necessary to be taught to local farmers, troughs observed were small, limited in quantities and too few for so much cattle; the volume of water a cow or buffalo drinks is directly related to the troughs' size, availability and size of herd they serve.

**Figure 19: Buffaloes do not drink enough water today**

## 5. Loose Animal Pens & Sponsored Animal Pens

Being that the buffaloes are tied all day, it would be recommended to develop trials by specific farmers in which pens are defined in which animals are not tied with free access to drinking water, this will allow the farmer learn any possible increases in yields purely based on free water consumption. Allowing the animals to drink more milk will not only contribute to higher milk production yields, but also will allow the animals produce more liquefied manure which in turn will be easier to flow into drains, require less water for dilution and flow of solid wastes into the town drains. This allows the animal become in part the diluting component while allowing the possibility of higher milk production.

### Sponsored animal pens

In order to procure additional funding for the above initiative, it would be recommended to consider implementing a regional bull-pen construction program, where low cost and simple to install pens are installed in villages and mall farms with the aid and support of a local consumer product company such as Nestle®, Pepsi® Tetra-Pak® or Coca Cola®. These pens could bear advertising signs by the sponsor in remote rural areas; being that Coca-Cola® and Tetra-Pak ® are currently seeking for leadership and presence respectively in Pakistan, maybe presenting this initiative to their management would turn into a successful advertising and farmer support campaign.

**Figure 20: Animal pens with loose animals with proper troughs**

## 6. Farm Manger Training Programs

During a visit with Sapphire farms, it was identified a potential opportunity in the training of Commercial Farm Managers. Currently Sapphire is completing the installation of a large (3000 cow) farm facility which is comprehensive and vertically integrated in the production area (i.e. local veterinary, own cow growing, own feed processing, etc). This is a concept ideal to train any incoming farm manager that seeks to be employed in any commercial dairy farm. 6 months certificate programs at Sapphire farms or similar.

Being that the owners of Sapphire expressed their interest in exploring further this possible initiative which would lead their large industrial consortium into the educational area; we must consider in developing further the initiative in which young farmers seeking to get into the commercial farming area are employed and trained in this farm under an structured certification 6 month program, where they will be exposed to all and every aspect a large commercial enterprise undergoes in a daily basis. Currently Sapphire employs two farm managers, an importer from Egypt whose income is in nearly 4 thousand dollars monthly. A program of this kind will be more attractive for rural farmers that lack the academic high school preparation required by UVAS and other livestock training institutions in the region.

Being able to graduate farm managers from a 6 month certificate program will allow those new commercial venture investors to count with the proper economic human resources required by their starting 50 cow dairy farms. Furthermore, through job placement entities with virtual exposure, Farm managers graduated for a Sapphire like set up, could then be places in other countries in the region which will allow them to generate higher income for their households.

International Dairy Farm placement sites:

a) http://www.aglsource.com/
b) www.jobsonline.net
c) http://www.indeed.com/jobs?q=dairy+farm&l=

## 7. Commercial Farm Model (Private Investment)

An initiative supporting the establishment of new and more commercial farms should be implemented. A model to implement is one that incorporates mechanical milking and pure breed milking animals. If possible SMEDA & MPG (and others) participation should be considered. An attractive business plan proposal with up to 5 year projections should be promoted through a business development campaign with assistance of Firms' professional team.

As a result of the discussions maintained with Mr. Adnan Ali of SMEDA, a model was prepared based on past and current programs being implemented by his institution. This model was adapted to the finding in this report and is hereby inserted as a sample of a typical commercial farm investment and potential productivity for any new commercial farmer interested in entering the milk production environment.

| INITIAL INVESTMENT CALCULATION | | | | | |
|---|---|---|---|---|---|
| | Unit Cost US$ | Unit Cost PRs | Total units | Total US$ | Total PRs |
| Imported Holstein Cows | 3,250.00 | 276,250.00 | 50 | 162,500.00 | 13,812,500.00 |
| Land and Building requirements in Acres | 43,529.41 | 3,700,000.00 | 1 | 43,529.41 | 3,700,000.00 |
| Milking Parlor (6x2 herring Bone from NZ) | 23,529.41 | 2,000,000.00 | 1 | 23,529.41 | 2,000,000.00 |
| Tractor/Trolley | 11,764.71 | 1,000,000.00 | 1 | 11,764.71 | 1,000,000.00 |
| Power Generator 25 Kva | 17,647.06 | 1,500,000.00 | 1 | 17,647.06 | 1,500,000.00 |
| Chilling Tank (1000 Ltr. Packo) | 5,000.00 | 425,000.00 | 1 | 5,000.00 | 425,000.00 |
| Rate $1.00 = 85 PRs | | Total Asset Investment | | 263,970.59 | 22,437,500.00 |

**Table 11: Initial Investment Calculation**

The previous table assumes importation of pure breed pregnant cows and ready to produce shortly after arrival. The cost of milking equipment may vary, however it would be recommended to implement PMO certify equipment from the US. The table below presents a typical scenario for dairy farm operation as presented by Mr. Adnan Ali of SMEDA and based on previous implementations of this type of facility by such agency. Water supply assumes that there is very limited supply on site and may need to be purchased or driven from outsources. Technical assistance and Extension & Veterinary services would be provided as contribution during the first year by Firms project.

**Table 12: Operations Expenses Calculation for Year 1**

| OPERATION EXPENSES CALCULATION FOR YEAR 1 | | | | | |
|---|---|---|---|---|---|
| | Unit Cost US$ | Unit Cost PRs | Total units | Total US$ | Total PRs |
| Farm Manager | 588.24 | 50,000.00 | 12 | 7,058.82 | 600,000.00 |
| Technical Assistances | 500.00 | 42,500.00 | 12 | 6,000.00 | 510,000.00 |
| Nutrition & Silage 25Kg./Day @ 300 PRs x 365 | 1,288.24 | 109,500.00 | 50 | 64,411.76 | 5,475,000.00 |
| Labor (10K PR's/laborer/ month*12) | 1,411.76 | 120,000.00 | 4 | 5,647.06 | 480,000.00 |
| Monthly Electrical Power Cost/Fuel for Generator | 705.88 | 60,000.00 | 12 | 8,470.59 | 720,000.00 |
| Extension and Veterinary Services | 500.00 | 42,500.00 | 12 | 6,000.00 | 510,000.00 |
| Water Supply | 500.00 | 42,500.00 | 12 | 6,000.00 | 510,000.00 |
| Rate $1.00 = 85 PRs | | Total Annual Operating Expenses | | 103,588.24 | 8,805,000.00 |

**Table 13: Revenue and investment recovery projections based on: year one operations, initial investment and proposed contribution by firms**

The preceding table does not include income from calves production and sales which will affect positively the net results of this operation. In addition the table presents a multiple scenario for recuperation of the initial investment based on average milk production yields per animal. Clearly, the higher the yield, the faster the recovery of the investment. In my opinion a realistic scenario would be the 24 liter average, so recovery would be in 4 ***vs.*** years which is a comparative fact with other business ventures of similar size. In year 5, once the initial investment has been recovered the profitability of this venture should be well in excess of 30% of annual revenues. It is important to point out that the food variable has been kept constant thus increments in yields will be related directly to water consumption and good health of the cows.

Further analysis of actual costing and percentage of contributions by Firms will be required before making formal presentations in different cities to prospective commercial farmers wanting to go into this venture. Once done and defined, a campaign jointly with government and semi private institutions should take place in order to market the concept and encourage local business people to want to enter into milk production ventures.

## 8. Cheese making, a Women's tradition.

This country is yet to discover the simplicity of cheese making and the possibility to making it a women's practice. Establishing a new variety of dairy product and since its beginnings is a tradition of women only, this will allow for a custom to be implemented since its inception. Cheeses traditionally to other regions with similar geographical and weather conditions such as the Northern Africa, Caribbean coast of Colombia, Central America & Mexico consume cheeses that require simple processed and no refrigeration to produce; a variety of cheese that is already consumed in Islamic countries of Africa, and could very well appeal to the Pakistani palate. A training course by a specialist would allow for processing and tasting trials and if acceptable by the local palates, sales of this product can take place directly in the streets of Lan-Women Cheese makers, a tradition to develop dhi without the need of refrigeration. Buffalo milk being the one most available throughout Pakistan and based on a 18% solid composition of the milk and that shelf tropical cheeses contain between 5 and 10 percent. Cheese production from buffalo cheese would be of nearly 25%. This means that on kilo of cheese can be produced from 4 liters of milk. If milk price is 40 PRs, the cost of milk for one Kg. of cheese produced would be not more than 200 PRs.

Retail price of cheese in portions of 250 grams could be at a rate of 150 to 200 PRs, giving a per Kg price of 600 to 800 PRs. This makes the producer into a small processor and retailer, integrating vertically the chain and leaving all the revenues in the town. Furthermore, cheese making today is becoming a more and more attractive activity for women since it requires no special strength but merely good manufacturing practices and better sanitary habits to which women have proven to be best at. Implementing an initiative where women are taught about milk, cheese processing and retailing of the product could very well begin a tradition in which women becomes the predominant gender in this manufacturing process, and one that can unite the family as a home activity that includes all the family members. Establishing a network of cheese making primarily run by women in each colony could lead to the establishment of a women cheese processors association which will bring higher representation for the group and greater importance in their towns, as well as better ways to attain future funding and implement joint capacity building programs.

**Figure 21: Women cheese makers, a tradition to develop**

### 9. Ladies Livestock Workers, replicating the CELDAC model

A complete Program brochure was presented to [redacted] where the Celdac model is explained and its results presented as a result of a three year initiative. This program was developed under UNDP financing and implemented jointly with DP, EF, Nestle & others. All initiatives implemented through this association, will be in the form of training programs available to all of its members, however a select group of farmers will be identified to implement the initiative directly. These identified farmers will be those who in turn will help train other farmers in the post program period. This will allow for the initiative to take a permanent format and the training and improvement process to be self sustainable by eventually charging for the capacity building activities.

***Specialized LLW*** It is recommended that the current model be complimented with additional trainings for the already graduated LLW, such as specialized training for specific services beyond and above the general LLW capacity program, this will take the LLW to a next level of specialization such as in the medical field, (General Practitioner and Specialties) where they can be referred to specific cases increasing their fees accordingly.

### 10. Anaerobic Digesters in Colonies and Larger Farms

It was observed a large potential environmental threat in all large farms. Such is that none of the farms visited are currently treating nor further developing animal waste both solid and fluid. This waste matter in the amounts observed particularly in the peripheral areas of Karachi, present an astronomical threat to the national and international environment as explained in the visit briefing earlier in this report. It is important that an

initiative already started by former international cooperators in Pakistan be continued and supported.

**Figure 22: PDDC Steel Bio Gas Digester Prototype**

Pakistan is signatory to the Kyoto Protocol, which commits the country to help reduce global contamination. This fact makes it necessary to pursue the proper mechanisms to help correct any current environmental threat situations. For this, it is necessary to reach to the United Nations Clean Development Mechanism (CDM) regulations under the United Nations (UN) Framework Convention on Climate Change (UNFCC). This mechanism is necessary to follow up with since in order to comply with the Kyoto Protocol agreements, all carbon reductions must be certified by the UN. Most importantly, once PDDC Steel Bio Gas Digester Prototype this Carbon Credits are obtained, such become a commodity traded in stock markets worldwide and are sold to environmental improvement firms worldwide who in turn invest in programs and enterprises that help develop the corrective measures through the financing development, establishment and operation of processing facilities that would clean the environment while produce usable resources for energy generation.

Therefore, the design and promotion of an initiative that would support the facts presented in the preceding paragraph would be an activity that could be considered by Firms jointly with other national and international cooperating organizations and governments, and why not with multinational corporations to entice them to set operations in Pakistan.

At the rural level, the same concept must be applied, here in a totally different scale. In rural and commercial farms an equivalent amount of solid waste is produced daily with a potential damaging effect to the environment. Being that these area more manageable situations due to its controlled volume of waste, it must be considered to replicate or promote a model of installation of bio digesters in farms as currently being implemented by PDDC. Under the “Biogas Program”, PD has installed nearly 100 bio digesters in the

Punjab region with very optimal results. These digesters are small enough to be built by rural laborers and easy to operate by any villager. The benefits of these digesters is that all animal waste is gathered, methane gas is generated by it, the gas is used to fuel cooking and the remaining dry matter is used as fertilizer in the fields. Clearly this alternative is a valid and viable option to keep environmental balance and simple enough that requires minor investment on part of the farmers and any cooperating agency.

### 11. Farmer Clusters MPG's Establish Central Milk Collection Stations

Currently some of the most developed clusters of milk producers under assistance by the LDDB, known as MPGs have associated and are delivering milk at prices negotiated collectively by the group. Current MPG Scheme

As these groups develop and grow in size and volume of milk, a new strategy to be considered for implementation; they should be assisted in implementing regional collection stations. These stations have a capacity of 25 thousand and more liters chilling tanks. From here milk is delivered in larger tankers to processors and prices are negotiated by one entity. But this transfer station should not only be limited to serve as a major transfer station, it must also include some processing ok the milk such as plate pasteurization and yogurt production facilities. A scheme of this type, will allow for new processors to develop in less urban areas, which themselves will demand more milk as their markets and processing needs grow. Furthermore, a self owned processing facility will give them more clout in negotiating their sales of milk, since they will have alternative options future processing of their milk. This alternative will secure higher prices and more control of the demand of the better organized clusters in less urban areas.

In order to have a good understanding of this concept, it is recommended to evaluate a similar model already operating in the US and one of the largest cooperatives in the dairy sector. Such is Dairy Farmers Association (DFA), which is the largest independent group of milk producers who own the largest network of milk transfer stations and processing centers in North America www.dfa.org

### 12. Research for Breed Improvement

It is common to find high yield milk producing buffaloes in most farms. The average yield of buffaloes is under 10 liter/day per animal; however, it is common to find occasionally up to 5% of buffaloes that will produce up to 20 liters per day. This animals should be identified and become part of a research to aid in breed enhancement or to reproduce embryos of better producing buffalos. This activity can be developed jointly with the BRI in Patoki or with the CEBG or Jassar Farms.

It is necessary to point out that any collaboration with Collaborate with BRI center will need also to address assisting them in developing a business model for the institution; one that is based on a Master Plan that incorporates a realistic business plan and a marketing plan with the objective of attaining self sustainability within 5 yrs.

Once The BIR implements it objective plan, it should be considered to provide services trainings for international farmers and insemination center of better breed and participate in international agricultural expositions such as:

a. Dairy Cattle exporters http://www.clunyexports.com.au/dairy.htm

b. World Dairy Expo in Wisconsin: http://www.worlddairyexpo.com/media-news-show-summary-2009.cfm

c. Agro Expo Colombia (where buffalo breeding has become popular in the last five years for mozzarella production. http://servicios.corferias.com/02/2009/index.cfm?intldioma=2&Strldioma=en

d. Expica: Central American Cattle Show, Nicaragua: http://puravidatravels.com/nicaragua_tour/EXPICA_Managua_Nicaragua_2.shtml

## 13. Industrial Mozzarella Processing Plant for Export

The history of Mozzarella is linked to that of the water buffalo. Nobody really knows exactly when the first water buffaloes came to Italy, but one account claims that it was in the year 596 AD when they were brought across the Mediterranean. This soft-copied but never duplicated cheese is a fresh, drawn-curd cheese made from whole buffalo's milk. Most people don't know what water buffalo milk tastes like, but upon one's first bite it is unmistakable that this legendary cheese is made from unfamiliar milk, buffalo milk.

Although not an initiative that would have high priority within the Firms program, it would be recommended to help prepare a professional presentation in which buffalo milk collectively supplied can be used as a base to prepare a business plan for a major mozzarella processing plant for the region. This product has high demand in markets such as China, Arab nations and all tourist island destinations in the Indian Ocean. Clearly is a proposition that would require substantial investment by an industrial private partner, reason for which professional business

model, presented by professionals in the field must be designed and presented to prospective commercial investors. Among some of these investors we could identify the larger diary and cheese processing conglomerates worldwide and also national industry consortiums like Engro Foods and others that may or may not currently be active in the processing food category.

Among some of the food trade shows recommended to consider attending in an exploratory period are:

- The Fancy Food Show in New York, annually in late June http://www.specialtyfood.com/do/fancyFoodShow/LocationsAndDates
- The largest Annual European Food processing show in Koln Germany http://www.anuga.com/
- One to the largest food shows in south east Asia, Thailand annually in the month of may http://www.worldoffoodasia.com/
- An important food show for the Asian Hotel industry in Seoul Korea, annually in early may http://seoulfood.or.kr/2009 IFIES Allworld/index.asp
- The largest middle eastern food show in the region, Dubai Food show held annually in the month of February http://www.gulfood.com/
- Middle East Food Show of Abu Dhabi annually during the month of April http://www.middleastfood.com/April 26-28, 2010

## 14. Website Development for KDFA & others

It would be highly recommended to assist the different associations visited with in the development of their own web site in which all programs which are being implemented by and jointly with them, and services they provide to its members can be presented in a user friendly manner. Additionally, it must publish any results of any experiments on feeding, drinking loose animal pens etc. can be presented for application by other farmers. This component of this program could be included in the gender area and procure all web site development services to be provided by women owned and women developed entities.

## 15. EPA Warning

It is current regular procedure for USAID programs to include sufficient measures to protect the environment. Any possible cooperation in this region or sector should take into account this factor. Dairy is a highly contaminant industry and thus we must prevent any possible or additional damage to the national environment.

## 16. Other Recommendations that may be implemented simultaneously to the above

- Currently their effectiveness rate of insemination is at 60%, however this includes males and females born. [redacted] is very interested in obtaining a new high technology device that will allow them to produce gender defined semen doses. This will increase the rate of female born calves by 100 percent, and even though their AI effectiveness rate will possibly be maintained, there will be a warranty of female calves being born of close to 100 percent of those effective inseminations. The cost of this equipment is approximately $120 thousand. A proposition worth considering for Firms as long as it is developed jointly with a program in which the CEBG provides semen doses to the beneficiaries in this dairy component of the program.

- A national Marketing campaign to promote processed milk consumption in which milk production quality and milk processing safety aspects are demonstrated and presented as best to consume. Pakistan does not need a campaign to promote milk consumption at this time since it appears to be one of the highest per capita consuming nations. Good milk consumption must be promoted and facts should be exposed for people to understand the need to consume properly produced, handled and processed dairy products.

- In addition, since they currently they lack a well developed data bank with regards to specific locations where the semen or embryos are applied, nor the statistics of the farmers they serve; it would be worth pursuing past proposition by NORTEL to provide mobile telephone equipment to all 38 extension service technicians, so they can photograph with GPS identifier equipment telephones and that allows them to submit the data via messages to a central data bank. This way the location of the application and other farmers' information can begin to get stored and eventually be able to better document a livestock map which currently is not available even at the Pakistan Census office.

- It would be very good practice as a part of cooperative dynamics for the key organizations in this sector to informally meet periodically (every 4 to 6 months) just to share experiences and concerns. This is usually attained by having as

guests at the meeting individuals of certain prominence in the sector nationally or preferably, internationally. This way all organizations have an opportunity to gather regularly and even though not officially associated, exchange views and experiences with the objective to jointly monitor the trends of the sector.

- Pakola plant, showed evidence of limited food safety practices which could be improved through proper HACCP in house training and certification.

# 4.0 STRATEGIC PLANNING, REQUIREMENTS AND RESULTS

| | ACTIVITIES' TIMELINE | Year 1 | | | | Year 2 | | | | Year 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qtr. 1 | Qtr. 2 | Qtr. 3 | Qtr. 4 | Qtr. 1 | Qtr. 2 | Qtr. 3 | Qtr. 4 | Qtr. 1 | Qtr. 2 | Qtr. 3 | Qtr. 4 |
| 1 | Installation of Chilling Tanks - new MCC points. | | | | | | | | | | | | |
| 2 | Feeding and Nutrition Efficiency Research | | | | | | | | | | | | |
| 3 | Promote Animal Water consumption in Rural Villages | | | | | | | | | | | | |
| 4 | Loose Animal Pens & Sponsored Animal Pens. | | | | | | | | | | | | |
| 5 | Farm Manager Training Programs | | | | | | | | | | | | |
| 6 | Commercial Dairy Farm Model | | | | | | | | | | | | |
| 7 | Cheese making, a Women's tradition. | | | | | | | | | | | | |
| 8 | Ladies Livestock Workers, the CELDAC model | | | | | | | | | | | | |
| 9 | Anaerobic Digesters in Colonies and Larger Farms | | | | | | | | | | | | |
| 10 | MPG's Establish Central Milk Collection Stations | | | | | | | | | | | | |
| 11 | Research for Breed Improvement. | | | | | | | | | | | | |
| 12 | Industrial Mozzarella Processing Plant for Export | | | | | | | | | | | | |
| 13 | Website Development for KDFA & others | | | | | | | | | | | | |

| | |
|---|---|
| | Activity Program Design, personnel search and preparation stage |
| | Research, Installation and Training Activities |
| | Activity and Related Programs Implementation Period |
| | Beneficiaries operating under supervision and assistance of FIRMS |

| | MEASURABLE OBJECTIVES | Year 1 | | | | Year 2 | | | | Year 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qtr. 1 | Qtr. 2 | Qtr. 3 | Qtr. 4 | Qtr. 1 | Qtr. 2 | Qtr. 3 | Qtr. 4 | Qtr. 1 | Qtr. 2 | Qtr. 3 | Qtr. 4 |
| 1 | Installation of Chilling Tanks - new MCC points. | | | 125 | 125 | 125 | 125 | | | | | | |
| 2 | Feeding and Nutrition Efficiency Research | | | | | | | | | | | | |
| 3 | Promote Animal Water consumption in Rural Villages | | | 250 | 250 | 250 | | | 250 | 250 | 250 | | |
| 4 | Loose Animal Pens & Sponsored Animal Pens. | | | 250 | 250 | 250 | | | 250 | 250 | 250 | | |
| 5 | Farm Manager Training Programs | | | | 50 | 50 | 50 | | | | | | |
| 6 | Commercial Dairy Farm Model | | | | | 10 | 10 | 10 | | | 10 | 10 | |
| 7 | Cheese making, a Women's tradition. | | | | 100 | 100 | | | 100 | 100 | | | |
| 8 | Ladies Livestock Workers, the CELDAC model | | | | 250 | 250 | 250 | 250 | | | | | |
| 9 | Anaerobic Digesters in Colonies and Larger Farms | | | | | | 50 | 50 | 50 | 50 | | | |
| 10 | MPG's Establish Central Milk Collection Stations | | | | | | | | 5 | 5 | 5 | | |
| 11 | Research for Breed Improvement. | | | | | | | | | | | | |
| 12 | Industrial Mozzarella Processing Plant for Export | | | | | | | | | | 1 | | |
| 13 | Website Development for KDFA & others | | | | | 5 | 5 | | | | | | |

| | |
|---|---|
| 3065 | Personnel Trained and Certified |
| 2251 | Units Created or Developed |

In order to develop and implement the above presented recommended activities efficiently and effectively, the following table presents the expected professional team members to be included as a part of the program:

| PERSONNEL REQUIREMENTS | PROFESSIONAL TEAM REQUIREMENTS & SPECIALIZATION | SPECIAL ALLIANCES RECOMMENDED FOR THE IMPLEMENTATION | Total Personnel |
|---|---|---|---|
| **Direction, Design & Strategic Planning** | • 1 International Dairy Sector Consultant ***(Mr. G. Pascual)*** | | 1 |
| **Development and Implementation of Strategic Plan** | • 1 Dairy Sector and Agro Industry Consultant preferably a pakistan national with experience in implementing similar programs as included in the recommendations of this strategic plan and ability to manage multiple tasks and personnel and with excellent analytical, writing and reporting skills (i.e.: ***Ms. Umm e Zia***) | | 1 |
| **Installation of Chilling Tanks - new MCC points.** | • 1 Program Coordinator, Dairy Production and Processing Specialist<br>• 4 Field Supervisors, Milk Collection Specialists | Alliance with Dairy Processing Company | 5 |
| **Feeding and Nutrition Efficiency Research** | • 1 Program Coordinator, Livestock Nutrition Specialist with research and statistical background experience<br>• 1 Nutrition Expert Consultant with qualifications in Nutrition Formulation and Livestock Feeding techniques (i.e.: ***Mr. Joaquin Westerweld, or Mr. Matt Brown***) | Alliance with 2 Mid Size Commercial Dairy Farms (1000 cow approx.) - (1 mechanical & 1 manual milking)<br>Alliance with a Feed supplier in pakistan that will help coordinate and support with their established logistics infrastructure | 2 |
| **Promote Animal Water consumption in Rural Villages**<br><br>**& Loose Animal Pens & Sponsored Animal Pens.** | • 1 Program Coordinator, Livestock Nutrition Specialist with research and statistical background experience (Same individual as for item 2)<br>• 6 Field Supervisors with livestock nutrition and husbandry background | Alliance with Consumer products National Company | 6 |
| **Farm Manager Training Programs** | • 1 Program Coordinator, Livestock Nutrition Specialist with research and statistical background experience (i.e.: ***Mr. Mat Brown***)<br>• 2 Farm Training Supervisors (one per farm) | Alliance with Existing Commercial Dairy Farm (i.e.: Sapphire and/or Engro) | 3 |
| | • 1 Program Coordinator, with back- | | |

| | | | |
|---|---|---|---|
| **Commercial Dairy Farm Model** | • 1 Program Coordinator, with background experience in dairy farm design and development (i.e.: ***Mr. Adnan Ali*** from SMEDA)<br>• 2 Support Field Personnel to assist in Farm development | Alliance with sector organizations (i.e.: SMEDA, PD, Ministries, other dairy Associations) | 3 |
| **Cheese making, a Women's tradition.** | • 1 Program Coordinator, Milk product processing and handling expert with preferred Cheese Processing background experience. To be employed during the time of implementation<br>• 1 Tropical cheese Making International Consultant (i.e.: ***Mr. Steen Moller*** from mexico) | It is recommended to develop this program preferably with Karachi Cattle Farm Colonies | 2 |
| **Ladies Livestock Workers, the CELDAC model** | • 1 Program Coordinator, Veterinary Dr. preferred with similar experience as ***Dr. Ms. Talat Qurash***i of DP | Program can be developed jointly with participation of Nestle, Engro, and other sector processors as well as other sector government organizations | 1 |
| **Anaerobic Digesters in Colonies and Larger Farms** | • 1 Program Coordinator, with background experience in dairy digester design and development (i.e.: ***Mr. Jon Schulz*** of DP)<br>• 2 Support Field Personnel to assist in rural digester construction and development | Program can be developed jointly with participation of sector government organizations | 3 |
| **MPG's Establish Central Milk Collection Stations** | • 1 Program Coordinator, Dairy Production and Processing Specialist | Program can be developed jointly with participation of sector government organizations | 1 |
| **Research for Breed Improvement.** | • 1 Livestock Nutrition Specialist Consultant with research and statistical background experience to be employed part time | Alliances with the Buffalo Research Institute, UVAS and the | 1 |
| **Industrial Mozzarella Processing Plant for Export** | • This activity is to be developed between the Sector Lead and the International Dairy Consultant (G. Pascual) | | |
| **Website Development for KDFA & others** | • This component can be developed by the existing CIT team of the FIRMS project | TOTAL PERSONNEL RECOMMENDED | **29** |

As a general result, we would expect to train and qualify over three thousand individuals, and establish or create over 2250 facilities for the sector. a total number of animals benefited is hard to be determine, however, the effect of this strategic plan should be extensive to several million heads of cattle that after properly implementing and developing each activity will be able to help reduce costs in feeding and increase production yields for more than 20%. New farms and new cattle will be incorporated into the chain and these will produce amounts of newly produced and processed milk as presented in the following tables.

| PROJECTED RESULTS | BENEFIT DESCRIPTION | Units | Total Units | Total Benefits |
|---|---|---|---|---|
| **Installation of Chilling Tanks - new MCC points.** | Collection of New milk for Industrial Proce | 1000 Ltr. of Milk | 500 Tanks | 500,000 Ltr. per day |
| **Feeding and Nutrition Efficiency Research** | Determining Optimal Feeding Formulation to obtain a reduction of 20% in Feeding Costs of 2 Million milk producing animals (Cost per day per animal 300 RPs) | 300 PRs per day | 2MM animals | 600 Million PRs savings per day |
| **Promote Animal Water consumption in Rural Villages** | Proper Water consumption should help increase by 20% to 30% in daily yields from 5 to 7 Ltr. daily; Assuming a rate of 5 animals per farmer | 1.5 Ltr. per day per animal | 1500 farmers | 3.04 Million Ltr. of Milk per Year |
| **Loose Animal Pens & Sponsored Animal Pens.** | Creation of these pens will allow 5 animals to be feed properly, allowing increments of 20% to 30% in yields by just proper drinking, feeding and handling | 1.5 Ltr. per day per animal | 1500 Pens | 3.04 Million Ltr. of Milk per Year |
| **Farm Manager Training Programs** | Trained Farm Managers for commercial farms can earn nearly 40 thousand PRs per month | Farm Managers | 150 | 72 Million PRs of new income per year |
| **Commercial Dairy Farm Model** | Establishing of 50 commercial dairy farms of 50 animals each with yields of 23 Ltr./day/cow | Commercial Farms | 50 | 310 Thou. Ltr. of Milk per year |
| **Cheese making, a Women's tradition.** | Training women in cheese making practices in Cattle Colonies will help save evening milk and give a new profession to women. Cheese sold will increase income for farmers. Each farmer can produce nearly 150Kg of cheese weekly (from 750 Ltr. of milk); cheese represents triple the price per liter of milk selling price | Cheese makers | 400 | 4.6 Million PR's per year per cheese making farm |

| | | | | |
|---|---|---|---|---|
| **Ladies Livestock Workers, the CELDAC model** | LLW can earn an average of 12 thousand PRs per month as proven by the CELDAC program. The benefit will not only be the new professions acquired by women and the income represented, but also the improvement in animal health and production of the farmers they aide. | LLW | 1000 | 15 Million PRs of new annual earnings for women |
| **Anaerobic Digesters in Colonies and Larger Farms** | Creation of new digesters in rural farms will help farmers generate their own fuel for gas cooking as well as better fertilizer for their crops. | Di-gesters | 200 | Gas savings to be determined based on local fuel costs |
| **MPG's Establish Central Milk Collection Stations** | Taking Milk Producing Groups to the next levels by establishing their group's own milk transfer stations with tanks of 25 Ltr. | Milk Coll. Station | 15 | Greater negotiating clout in selling their milk |
| **Research for Breed Improvement.** | Assisting Breed improvement institutions in Pakistan will have a long term effect that is rather difficult to anticipate any projected results for a three year period | Breed Research Inst. | 1 | |
| **Industrial Mozzarella Processing Plant for Export** | A joint effort between private sector and foreign enterprises could lead to establishing a major Mozzarella cheese processing facility | | 1 | 2 Million Dollar of Foreign investment. |
| **Website Development for KDFA & others** | Websites created for Associations which will allow further development &better communication to members | Website | 1 | |

## 4.1 Milk Constituents

| MILK CONSTITUENTS COMPARISON CHART | | | | | |
|---|---|---|---|---|---|
| **Constituents** | **Units** | **Cow** | **Goat** | **Sheep** | **Buffalo** |
| **Protein** | % | **3.2** | 3.1 | 5.4 | **4.5** |
| **Fat** | % | **3.9** | 3.5 | 6.0 | **8.0** |
| **Carbohydrate (Sugars/ Lactose)** | % | **4.8** | 4.4 | 5.1 | **4.9** |
| **Energy** | Kcal | **66** | 60 | 95 | **110** |
| | KJ | **275** | 253 | 396 | **463** |
| **Fatty Acids:** | | | | | |
| **Saturated** | gram | **2.4** | 2.3 | 3.8 | **4.2** |
| **Mono-unsaturated** | gram | **1.1** | 0.8 | 1.5 | **1.7** |
| **Polyunsaturated** | gram | **0.1** | 0.1 | 0.3 | **0.2** |
| **Cholesterol** | mg | **14** | 10 | 11 | **8** |
| **Calcium** | i.u. (*) | **120** | 100 | 170 | **195** |

## 4.2 Business Cards of parties visited

Business cards were deleted from the final version to the to safeguard the respondents identities

# 5.0 REFERENCES


ABC2009.Org (2009). *Asian Buffalo Congress Program*. Retrieved from www.abc2009.org/program/

Artisinal Cheese News. (2007, April 19). Cheese Making, is it women's work. Retrieved from http://blog.artisanalcheese.com/cheese news/cheesemaking-is-it-womens-work

Broadwater, N. (2007). *What if Cows don't Drink Enough Water.* Retrieved from http://www.thecattlesite.com/articles/1222/what-if-cows-dont-drink-enough-water-part-1

Butler, J. (2009). *The Australian Woman Cheese maker.* Retrieved from http://www.womenaustralia.info/biogs/PR00820b.htm

Convention on Climate Change. Retrieved from http://unfccc.int/resource/docs/convkp/kpeng.pdf#page=12

Cow Waste Management for Energy Generation http://www.riverdeep.net/current/2002/03/032502t cowpower.jhtml

Dairy Pakistan http://www.pakistan.gov.pk/ministries/industriesandproduction-ministry/media/DA IRYPAKISTAN.pdf

Final PISDAC III Report: Economic Impact Assessment of Pakistan Initiative for Strategic Development and Competitiveness

GOP urged to develop dairy exports (Dawn News): http://www.dawn.com/wps/wcm/connect/dawn-content-library/dawn/news/business/government-urged-to-develop-dairy-exports-il

Handbook of Dairy Nutrition of Pakistan

http://www.usaid.gov/pk/downloads/eg/PISDAC IA.pdf

Information on anaerobic Digesters. Retrieved from http://www.anaerobic-digestion.com/

Instruction on Building Bio Gas generation facilities. Retrieved from http://www.build-a-biogas-plant.com

J.E. Austin Associates, Inc. (2008). *Economic Impact Assessment of the Pakistan Initiative .* Marcos Arocha.

Jalil, H., Rehman, H., Sial, M.H. and Hussain, S.S. (2009). Analysis of Milk Production System in Peri-Urban Areas of Lahore (Pakistan): A Case Study. *Pakistan Economic and Social Review 47*, (2), 229-242. http://pu.edu.pk/images/journal/pesr/PDF-FILES/6%20HAFEEZ%20Analysis%20of%20Milk%20Production.pdf

Manure Energy a Reality for New York (PM Newswire): http://www.prnewswire.com/news-releases/renewable-energy-from-manure-beco mes-reality-for-new-york-79069037.html

Mastitis on Dairy Cows http://www.vetmed.ucdavis.edu/vetext/INF-DA/INF-DA MASTITIS101.HTML

Pakistan Sector Assessment Report, USAID Funded FIRMS Project Pakistan Initiative for Strategic Development and Competitiveness Initiative http://www.usaid.gov/pk/downloads/eg/PISDAC.pdf

Physiological effects of consumption of high saline water contents on dairy cows. http://jds.fass.0rg/cgi/reprint/6l/l/66.pdf

Pre-feasibility Study on Dairy (100 Animals) by SMEDA http://www.smeda.org/business-development/pre-feasibility-studies.html

Ranaweera, N. (2007). Improved Market Access and Smallholder Dairy Farmer Participation for Sustainable Dairy Development. Lessons Learned Sri Lanka. Retrieved from http://s3.amazonaws.com/zanran_storage/www.aphca.org/ContentPages/45037639.pdf

Rural Costa Rica (2007). Example of How to Build a Rural Bio Digester Retrieved from http://www.ruralcostarica.com/biodigester.html

Sarwar, M., Khan, M.A., Mahr un Nisa and Iqbal, Z. (2002). Dairy Industry in Pakistan; A scenario. *Internation Journal of Agriculture and Biology, 4,* (3), 420-428. Retrieved from http://www.docstoc.com/docs/15815165/Review-Dairy-Industry-in-Pakistan-A-Scen ario

The Manual of Buffalo Milk Production by DeLaval http://www.delaval.com/Products/Buffalo/default.htm

The State of Pakistan's Dairy Sector: An Assessment http://cmer.lums.edu.pk/upload/The State of Pakistan.pdf

The White Revolution 'Doodh Dariya' (White Paper on Pakistan Dairy Sector http://www.pakistan.gov.pk/divisions/industriesandproduction-division/media/DairyPakistanPublication.pdf

UN FCCC Application for Accreditation of Landhi cattle colony Biogas production Ctr. http://cdm.unfccc.int/UserManagement/FileStorage/T3FMS0TCI2SS0LXS0E5XBZ5El NOIZS

United Nations. (1998). Kyoto Protocol to the United Nations Framework

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